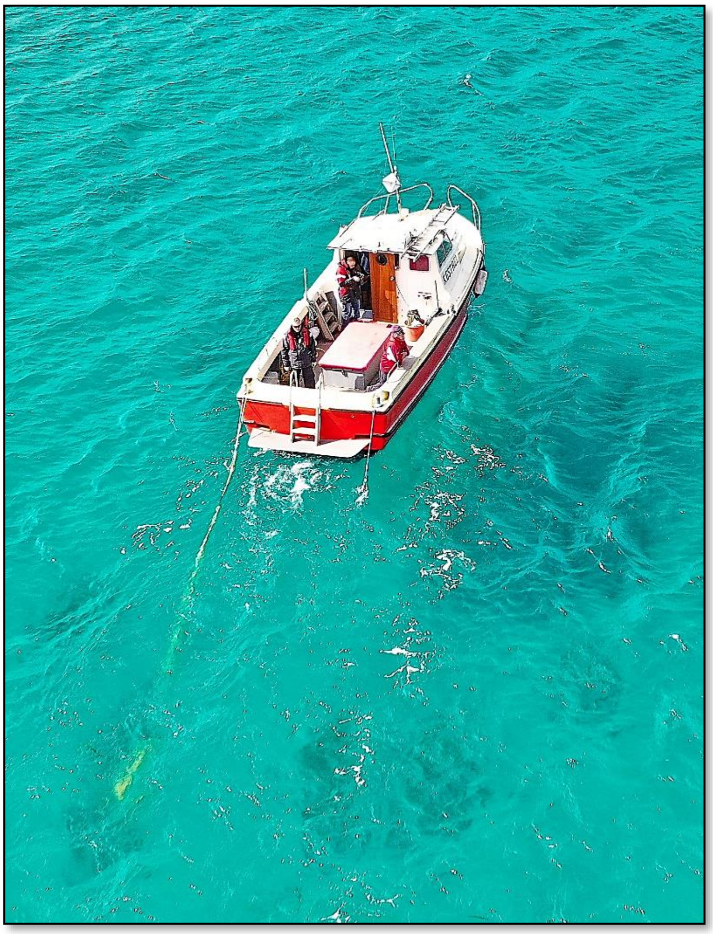
Catching The Drift

Colossus Eastern Debris Field Survey



Project Report

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Mark James / MSDS marine sponsored the project by loaning the survey equipment without charge. Mark gave generously of his all too limited time and managed the geophysical survey throughout, which included defeating the inevitable electronic and software gremlins which always attend geophysical survey at sea.

I would like to acknowledge the contribution made to the project by CISMAS members. They worked tirelessly for no pay, giving up their valuable time in order to take part – often working long days and always to the highest standards. Without them this project would not have been possible.

I need to thank Adam Morton, the exceptional skipper of the dive charter boat *Kestrel*, who was always cheerful and very helpful; and steered some of the most accurate survey lines I have ever seen.

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Cover Photograph: Survey in progress in St Mary's Sound: drone pilotage and photo by Martin Davies

The Team

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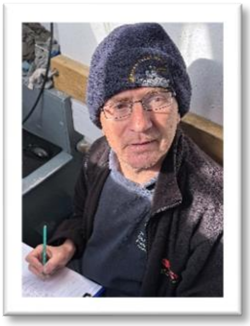

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Project Name

Catching the Drift. *Colossus* Eastern Debris Field Survey 2024 [9290]

Summary

This project comprised the investigation of a possible debris trail, previously unsuspected, to the east of the wreck of HMS *Colossus*. The reasons for suspecting this to be a debris trail are given below. The proposed investigation took the form of a geophysical survey consisting of side-scan sonar and magnetometer surveys. The geophysical data was collected successfully. Analysis of the data has resulted in magnetic and side-scan sonar target lists which will need further investigation. Further analysis of the geophysical data will also be undertaken by CISMAS over the coming months and years.

Background

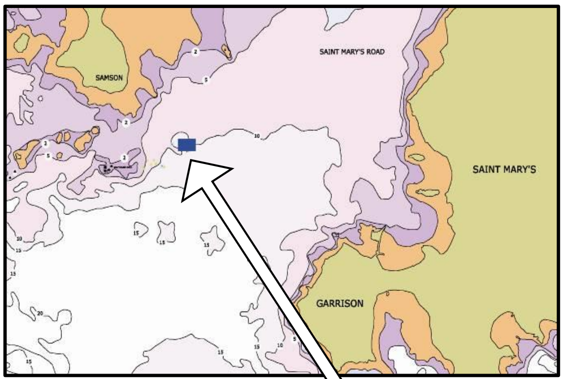

Fig 1
The location of the designated wreck site HMS *Colossus* in St Mary's Road, Isles of Scilly

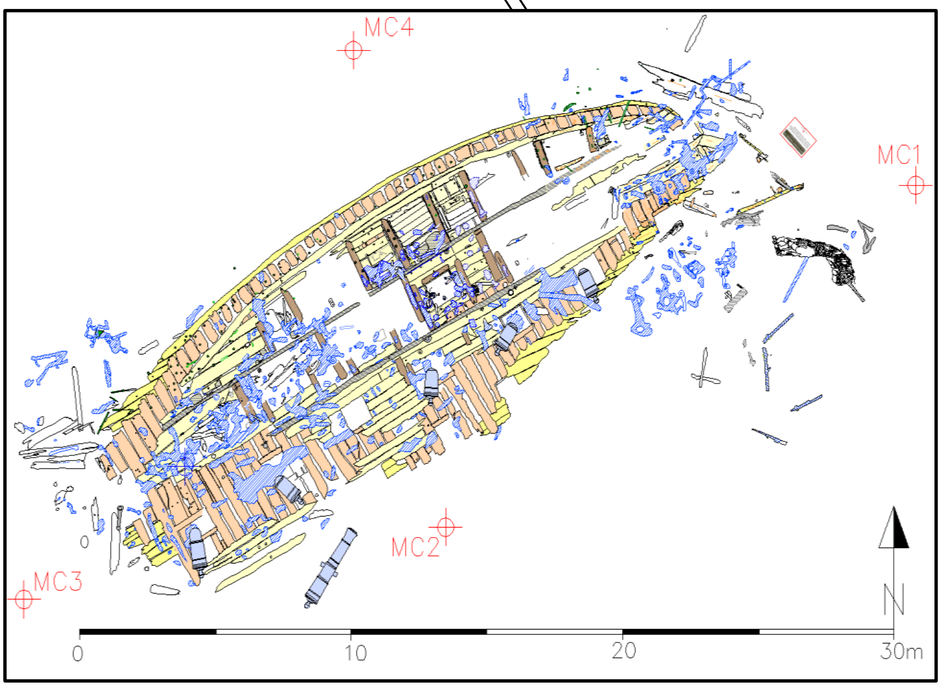

Fig 2
Site plan showing the exposed stern of HMS *Colossus*

The Ship

HMS *Colossus* was a 74-gun warship built in 1787 and wrecked eleven years later on the Isles of Scilly. She was the first warship to bear the name; five others were built over the years culminating in an aircraft carrier launched in 1943.

Colossus was at Naples on 28th September 1798, Nelson's 40th birthday. A lavish celebration was organised for Nelson by Sir William Hamilton's wife Emma, to which the captain and officers of *Colossus* were all invited.[1] When *Colossus* left Naples a week later for refit in England, she was carrying one third of Sir William's valuable second collection of ancient Greek pottery. She also left without one of her bower anchors and three of her guns, all given over to Nelson's ship *Vanguard* to replace items lost at the recent battle of the Nile.[2]

Loss

Colossus reached Scilly in December 1798 in charge of a convoy of merchant vessels. The ship was at anchor in St Mary's Roads sheltering from a storm when the anchor cable parted and she was driven onto shallow ground, losing her rudder and sustaining progressively worsening damage until she foundered with only the poop and quarterdeck above water. All but one of the 595 souls aboard were taken off safely in small boats. The ship soon turned onto its beam ends and began to break up, a process hastened the following month when the crew of HMS *Fearless* were employed *'breaking up the wreck'*.

Salvage

As well as two Navy transports full of stores and fittings recovered from *Colossus* in January 1799, a great deal was salvaged over the next few years. Guns, carriages and shot were raised by the intrepid diver Ralph Tonkin of Penzance in August 1799.[3] Others found more guns in 1800 and 1802. The last salvage we know about was undertaken by John Dean, who in 1833 recovered a number of guns and three quarters of a ton of copper from the wreck.

Rediscovery

By the twentieth century all knowledge of where the wreck of *Colossus* lay was lost. The only clue was a number of newspaper accounts, all stating that she had *'drifted onto a ledge of rocks, called Southern Wells*'. The lure of Sir William Hamilton's lost treasure has prompted many adventurers to seek the wreck of *Colossus*. The archaeologist John Dunbar hunted for it in the 1950s[4] as did several of the teams salvaging the wreck of the *Association* in the 1960s – all were led astray by those newspaper accounts. Then in 1974 a team led by Roland Morris found not only evidence of wreck, but also over 30,000 fragments of Sir William's ancient Greek pots. The site was designated in 1975. The British Museum backed the excavation and the pieces of pot are now in London at the British Museum. Morris also found 12 guns and numerous other artefacts, all of which he recovered. Some

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[1] *Horatio Nelson*, Pocock 1987. P176

[2] *Vanguard* received one 32, one 18 and one nine pound guns from *Colossus* – Captains Log, *Vanguard*: ADM51/1288

[3] *Salisbury & Winchester Journal*. 29 July 1805. P4

[4] *The Lost Land*, John Dunbar 1958 pp 32, 63

were housed in his Museum of Nautical Art in Penzance, until the contents were sold at auction in 2001/2.

Morris published his site plan and was convinced he had found the wreck of *Colossus*, scattered over an area extending some 250m with the stern at the west (where he found rudder pintles) and her bow to the east (where he had found evidence of the galley). However, the rudder had been beaten off many hours before the ship foundered and the evidence for the galley area was *'smoke blackened marble slabs'.* The galley stove on *Colossus* would have been made of iron, and would have sat on bricks. What Morris found were probably fragments of burnt marble taken from the ruins of a Roman villa near Naples by Sir William.[5]

Fig 3
Roman Villa San Marco, at Stabiae (1st century BCE) near Naples.

Caldarium (the hot room of a Roman baths) with a marble faced bath and now missing bronze water-heater (large circular hole).

The site guide says 'The boiler was one of several items taken by Sir William Hamilton that were lost in 1798 when the ship *Colossus* carrying them foundered'.

Morris finished removing the wreckage in 1983 and the site was de designated in 1984. What Morris had never found were any substantial pieces of the hull itself.

And then there was more… a lot more

In 2001 a large area of hull timber was discovered more than half a kilometre to the east of the Morris site. It became evident that this area of timber represented the port side of the ship from the mainmast to the stern – essentially the back half of the ship. The timbers of the hull were in remarkable condition and some of the guns were still in place. A large piece of decorated timber from the quarter gallery was raised, conserved and is now on display on the island of Tresco.

Changing perceptions

What is interesting is how the perception of the wreck site changed after 2001. It was now thought that as the new site was clearly the stern, then the Morris site must have been the bows. It was still assumed that the ship had originally foundered on the Morris site to the west of the stern. The stern

[5] *Villa San Marco, Stabiae, Bay of Naples an Archaeological Guide*, Keppie 2009 p149: '*baths whose caldarium was heated by a bronze water-tank spirited away by Sir William Hamilton and lost in the wrecking of HMS Colossus off the Scillies in 1798*'.

section was thought to have drifted east some 500m, shedding material along a debris trail as it went – but did it?

CISMAS undertook a lottery-funded survey of the *Colossus* debris field in 2004/5. The aim was to map the debris from the wreck and determine its extent. A magnetometer survey of the area between the two sites had been produced by the ADU. This was extended by CISMAS and the most promising targets were all dived and recorded. The survey did not extend far to the east of the stern site. It indicated a trail of material between the two sites, but also found debris to the south and east of the stern site. This was the genesis of growing doubts: at which of the two sites had the ship foundered?[6]

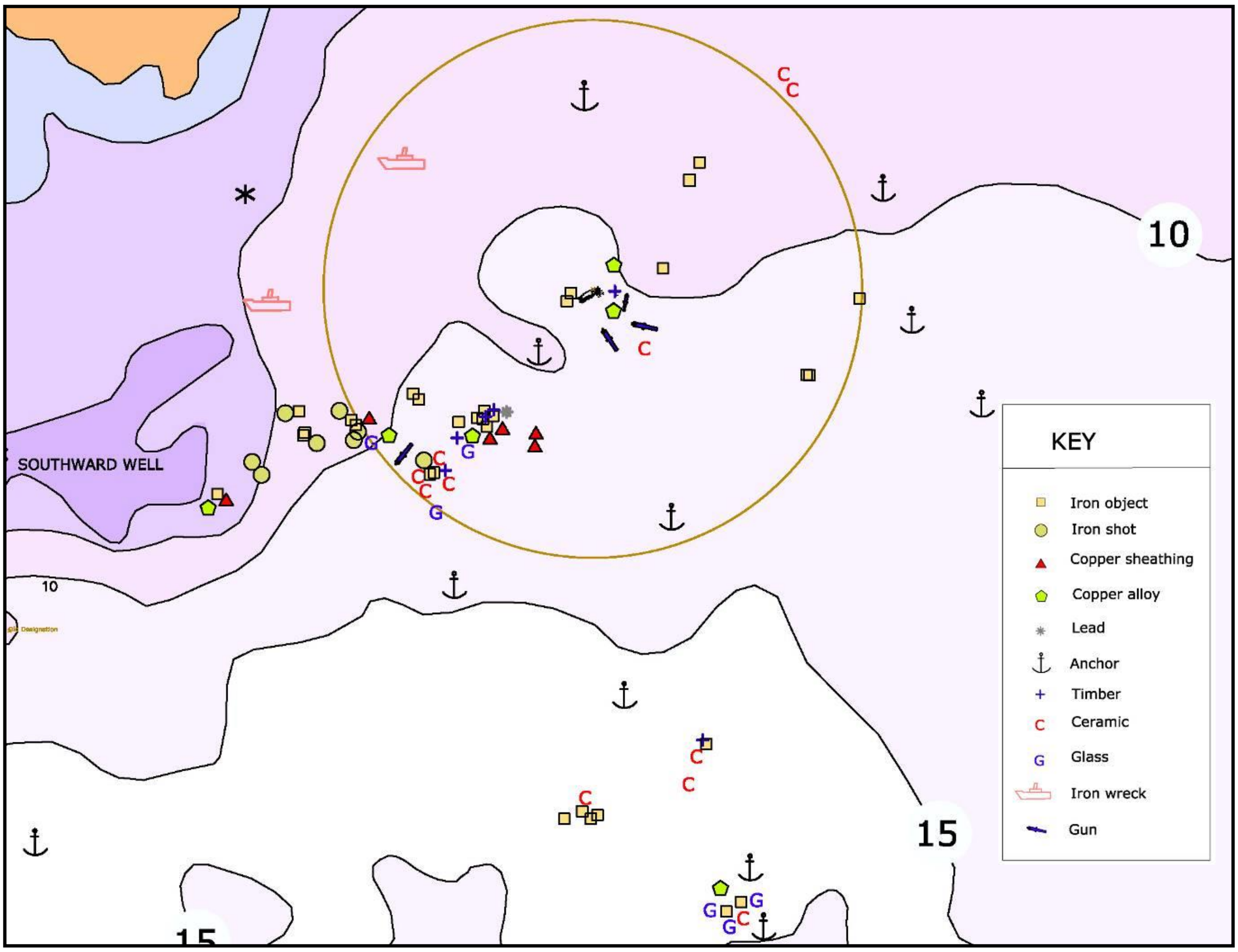

Fig 4
Plot of the debris discovered in the 2005 CISMAS debris field survey (not all the material found was from *Colossus*)

[6] *HMS Colossus Debris Field Survey*, 2005. Download at www.cismas.org.uk

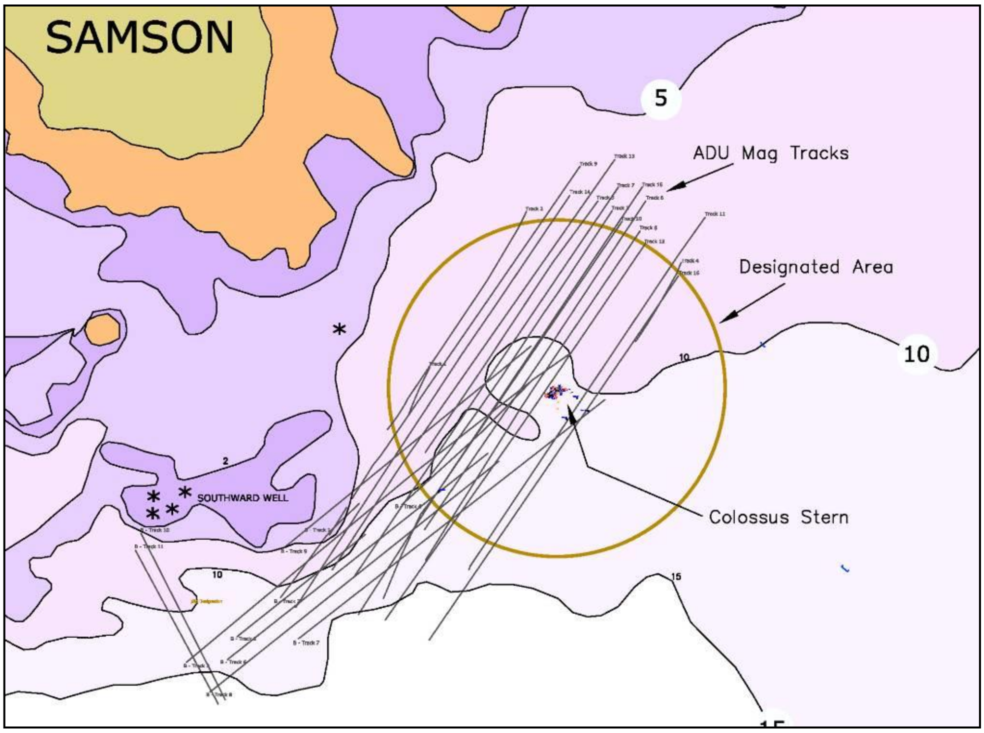

Fig 5
Plan showing the area covered by the ADU 2001/2 magnetic survey.

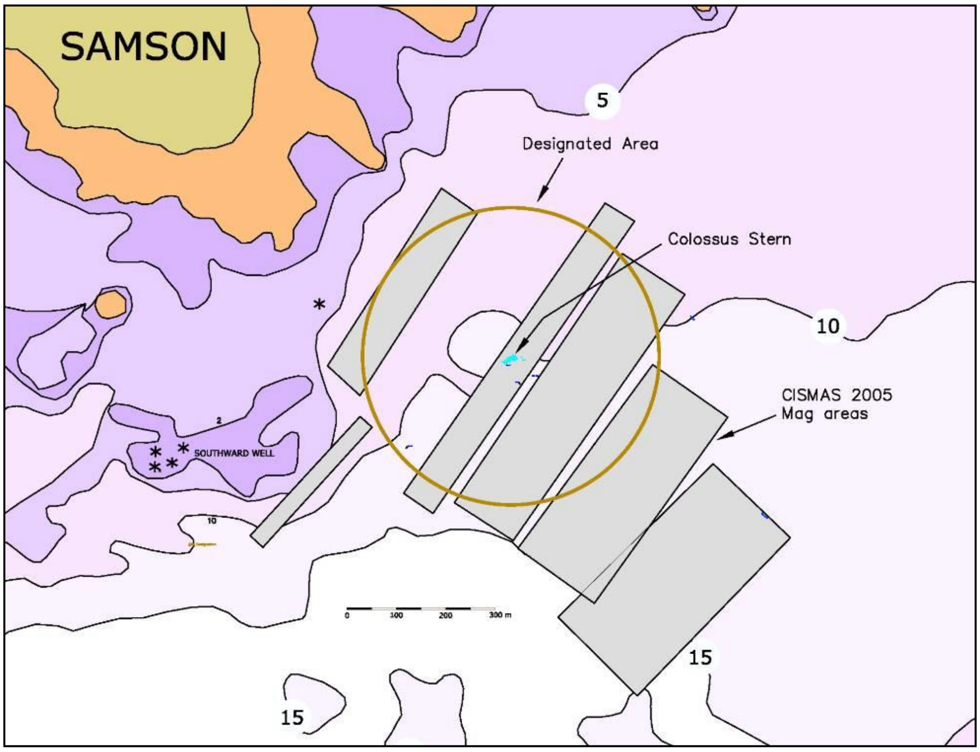

Fig 6
Plan showing the area covered by the CISMAS debris field survey 2005. The designated area is 600m in diameter

Extensive diver searches undertaken to the east of the stern site in 2017 revealed a wealth of ship fittings whose location was puzzling. A theory that *Colossus* had originally foundered some 30 metres to the east of the stern site was proposed – but although this theory explained numerous anomalies, it could not be proven.[7]

The testimony of John Dean's weights

Two substantial lead weights were located in 2017. Their importance was not at first realised. Eventually they were recognised as exactly the type of weights John Dean used in his early diving equipment. What caused him to jettison or lose his weights is not recorded, but they remained as testimony to exactly which site he had been diving on when he recovered iron cannon and copper sheathing in 1833. It is recorded that '*John searched for and quickly found the wreck of Colossus'*.[8] This would only have been possible because, as it was then only 35 years since she was lost, there were still plenty of islanders who remembered where the wreck was. This demonstrates that the stern, where John Dean lost his weights, was where the *Colossus* originally foundered and that the 'bow site' is in fact only part of the debris trail distributed by the tide when the ship broke up.

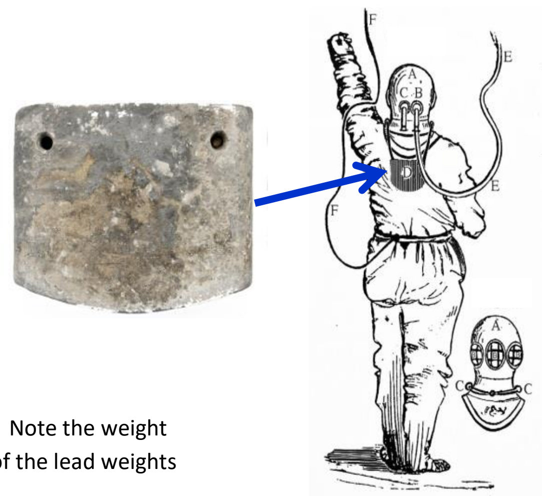

Fig 7
Right – the Dean helmet and dress as illustrated in 1842. Note the weight suspended from the helmet by two ropes. Above – one of the lead weights (C10.15) recovered from near the stern of *Colossus*

Why does this matter?

This has changed the centre of gravity for the site. Previously we thought of the old Morris site as where the ship had foundered, and thus the origin of all the wreck material. The debris field which exists to the west of the stern site was thought to have all been 'travelling' east from the Morris site. Now we know that *Colossus* foundered at the 'stern site' and that the material Morris found was small parts of the wreck which had broken off and been carried west by the tide from where the ship was lost. This explains why he found no large structural pieces. But while the tidal flow is westwards on the ebb, on the flood tide it is towards the east. So how much wreckage went east?

[7] HMS *Colossus* The Wrecking Project 2017. Download at www.cismas.org.uk
[8] The Infernal Diver, Bevan, 2010, p. 90

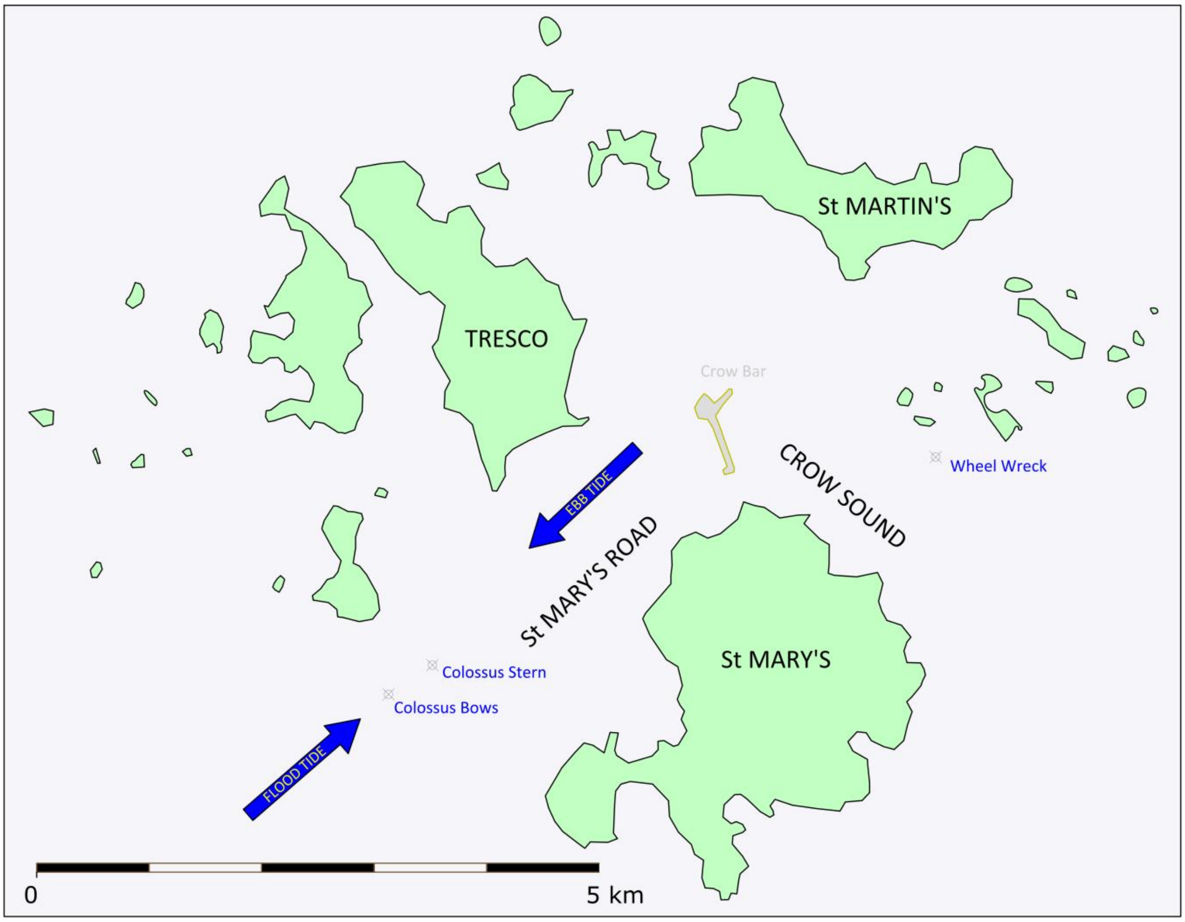

Fig 8
Map showing the main tidal flows over the site

The Historic Evidence

Shortly after the wreck of *Colossus*, an anxious Sir William made enquiries as to whether any of his ancient Greek pottery could be salvaged. The following extract is from a letter written in November 1799, from Major Bowen (commander of the Star Castle on St Mary's) to Sir William's nephew:

> *The Colossus being, as is generally thought here, in a very weak state, broke up uncommonly soon after striking on the rocks. The people of St Martin's island met several packages drifting out at Crow Sound, among the rest those described to them as Sir W. Hamilton's. They assert that, anxious to fulfil Captain Murray's and my earnest injunctions, they used the utmost efforts for recovery of the latter; but the sea running very high and the wind blowing a storm, they found it impossible to lift the packages which were very large into their boats. They then tried to disengage the contents. Unfortunately, in this also they failed. Their solemn declaration to me is, in their own words, that 'they saw on opening the canvass cases, several large pieces of most beautifully painted clome' (the name for earthen ware here); 'but that, on their trying to lift them, whether from the effect of seawater on them, or a cement used in joining them, a single piece could not be taken into the boat, each giving way in their hands like wet dough'*

Major Bowen goes on to say that another crate had washed up on the island of St Martin's, where at least ten of the pots had been recovered whole and purchased from the islanders on behalf of Sir William. There were eight crates of pottery aboard *Colossus*. From the vessel count made by the BM of the pottery recovered by Morris, it seems that at least three of the crates went west and lodged in a gulley where Morris found and recovered them. Several more crates, apart from the one washed up at St Martin's, went east and were seen at Crow Sound. This all demonstrates that as *Colossus* broke up, wreckage went west on the ebb tide, where Morris later recovered much of it. But some went east on the flood tide – how much waits to be found?

Project Aims

To establish the presence and extent of an eastern debris field.
The reasons for suspecting there might be an eastern debris field are set out above. If an eastern debris field exists it would change the extent and focus of the site and would have implications for how the site is managed and investigated in the future.

A better understanding of the dispersal of wreck material.
The western debris field extends for about 600 metres to the south-west of the stern site – it has been investigated and known about for over 20 years. We can expect the eastern debris field to extend a similar distance to the north-east of the stern. There are still significant parts of *Colossus* which have never been found (such as the keel, deadwood, some of the guns and the ballast). The eastern debris field has the potential to contain some of these missing items.

Enable future volunteer engagement with this site
The geophysical survey is likely to produce a list of potential targets which will then need to be investigated and recorded. This will provide a meaningful task to encourage continued participation of CISMAS and other volunteers in the archaeology of this site from September 2024.

Provide experience for future practitioners
The provision of a place for a student on the team will provide practical experience in marine geophysical survey for one person. There will also be provision for two volunteers from CISMAS to join the team thus maintaining the link between volunteers and the investigation of this site (These volunteers will be Kevin Camidge & Nick Sodergren)

Fieldwork

The potential eastern debris field covers a large area of seabed. The most economical method of investigating this area was deemed to be a geophysical survey of the seabed to the north east of the *Colossus* wreck site. We decided to use a combination of side-scan sonar and magnetometer survey to search for debris from the wreck. The choice of side-scan sonar rather than multibeam was engendered by the nature of the known western debris field, which consists of relatively small items of debris lying flat on the seabed. Previous work on this site has demonstrated that side-scan sonar is better able to detect this type of material than multibeam survey. The addition of the magnetometer allows the identification of ferrous material even if there is no seabed profile.

The fieldwork was undertaken between 20-27th of April 2024 by a team of six people (five survey and one charter boat skipper). The survey was led by Mark James of MSDS Marine, assisted and understudied by sponsored intern (*aka* sorcerer's apprentice), Martin Davies. The final three members of the team were CISMAS volunteers: Kevin Camidge, Sharon Austin and Nick Sodergren, whose task was to provide the deck crew and dogsbody elements of the survey.

The month leading up to the survey were characterised by storms which closely followed one another through the south west of England. The weather miraculously cleared just before we set off for Scilly and we enjoyed almost perfect survey conditions for most of our stay in the islands.

Fig 9
A view across the survey area (looking south) with the islands of Samson, Bryher and Tresco in the background.

Survey Areas

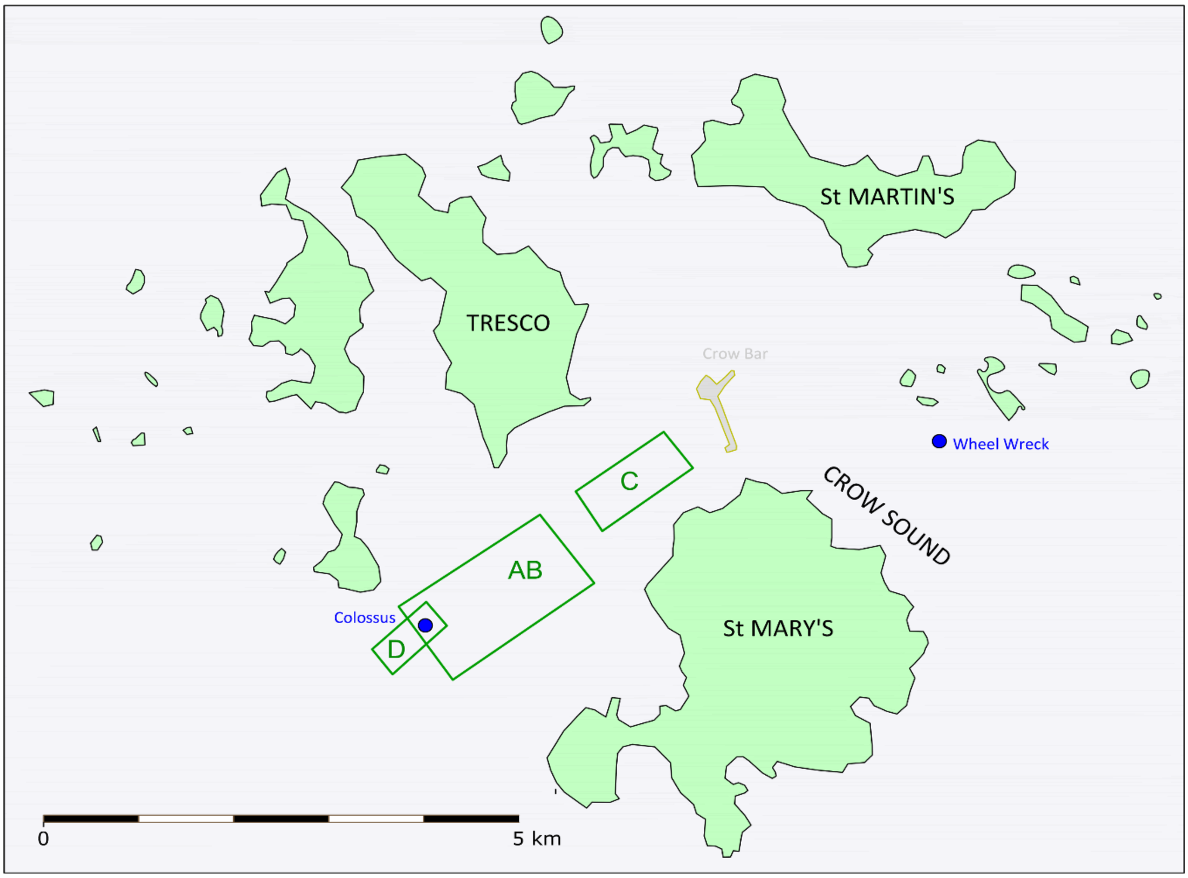

Fig 10
The location of the survey areas AB, C and D (shown in green). Note that survey area D partly overlaps area AB. The blue circle shows the location of the main stern wreckage (also the centre of the 2001 designated area).

The original plan was to conduct the survey in four separate survey areas: A, B, C and D (see Catching the Drift Project Design, 2023). As the weather at the beginning of the survey was particularly benign, we decided to take advantage of the good conditions and amalgamated the first two survey areas, A and B. This had the advantage of halving the number of times the vessel had to turn around at the end of each survey line. The shape of survey area C was altered to take account of some very shallow and weedy seabed. Finally, it was decided to move survey area D so that it covered the western debris field – as there was no high-quality side-scan sonar data for that area, it had the potential to indicate further, as yet undiscovered debris.

Equipment

The survey equipment was provided by MSDS Marine as a donation in kind to the project. MSDS Marine has undertaken numerous marine geophysical surveys on historic wrecks and has a proven track record in this field. The survey was conducted from the Isles of Scilly charters boat *Kestrel* **fig 23***,* an 11m fishing charter boat previously used for survey work by Plymouth University skippered by Adam Morton of St Martin's.

Fig 11

The survey equipment on the quay at St Mary's harbour, awaiting transport to St Martin's

Side-scan sonar

A C-Max CM2 side-scan sonar was used for the survey, which was conducted at 325 kHz with a port and starboard range of 50m. With these settings the system has a lateral resolution of 78mm. An area around the wreck itself was surveyed at the higher resolution of 780 kHz with a range of 25m port and starboard. Survey lines were 25m apart, except in area C where they were 40m apart.

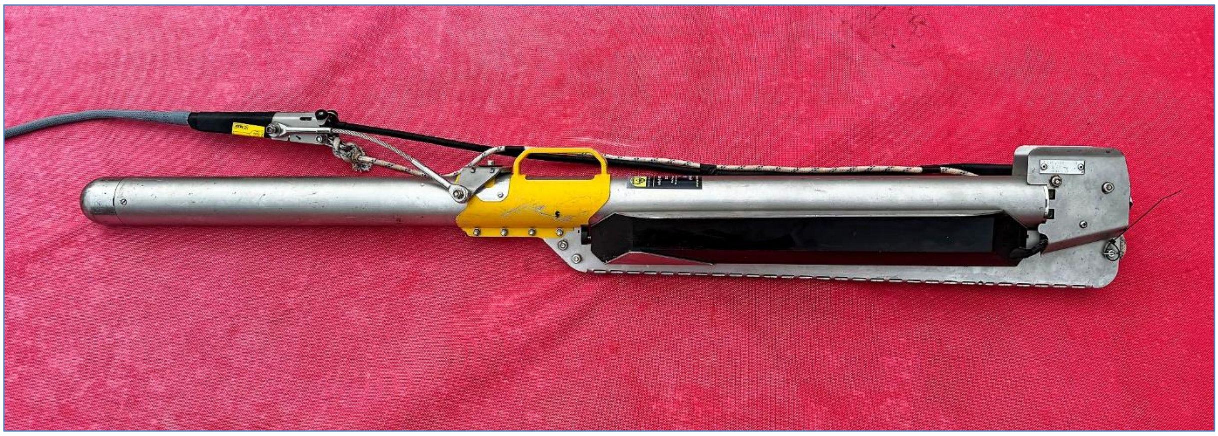

Fig 12
The C-Max CM2 towfish

Magnetometer

A Marine Magnetics SeaSPY2 marine magnetometer was used for the survey. The SeaSPY2 is an Overhauser type magnetometer with a refresh rate of 4Hz. This rate enables a reading approximately every 0.5m at a survey speed of 4 knots. The magnetometer was deployed along the same survey lines as the side-scan sonar, (25m spacing except in area C where they were 40m apart).

Fig 13
The Marine Magnetics SeaSPY2 towfish

Position fixing

The vessel position was provided by a CSI wireless DGPS Max with a refresh rate of 10 Hz. This can achieve a horizontal accuracy of 0.6m. The positions of the side-scan sonar and magnetometer were calculated using layback in relation to the tow points. Positional data was recorded directly within the side-scan sonar and magnetometer data.

Power supply

Power was provided from a lithium 240v power bank, the magnetometer was powered by a 12v lead acid battery.

A more detailed survey methodology is presented in appendix I

Fig 14

View from the stern of the survey vessel. The magnetometer is on the port side and the side-scan sonar on the starboard side

Methods

The side-scan and magnetometer data were collected simultaneously. Each instrument was towed behind the boat (magnetometer on the port side, side-scan on the starboard side). To affect a further separation of the two instruments, the magnetometer was deployed with a larger layback (more cable out) than the side-scan. The actual amount of layback for each instrument was determined by the speed of the boat, tidal current and depth of water. Deployment, layback adjustment and retrieval were managed by the two CISMAS volunteer deck hands, Nick Sodergren and Kevin Camidge.

Recording of the data was managed on two laptop computers by the survey manager Mark James and the survey assistant Martin Davies. The survey assistant also recorded all the data pertaining to each run line on the standard CISMAS geophysics log sheet, which makes the analysis of the data much easier. An example of this geophysics log sheet is shown in appendix II.

Results

Magnetometer

The magnetic data collected included the magnetic field strength, GPS position and a timestamp. The GPS position was corrected for layback and lateral displacement (relative to the GPS antennae) by MSDS in post processing. The data is stored as plain text CSV[9] in separate files for each runline of a search area. This data can be readily accessed without expensive proprietary software.

Selection of the magnetometer targets was made by CISMAS members Kevin Camidge and Nick Sodergren assisted by Martin Davies. There is some scope for further analysis of this data, in particular the smaller anomalies (<5nT) which have currently been disregarded.

The magnetic targets were chosen by plotting the measured magnetic field strength as a time series graph in Microsoft Excel. The advantage of using this method is that, as the software is widely available, all members of the team can get involved in target selection. When viewing a run line of data as a time series graph the anomalies are immediately apparent to any observer. Anomalies with an amplitude of less than 5 nT[10] have been largely omitted from the magnetic target list for the moment. However, past experience has shown that important material can be identified by careful examination of these sub-5nT anomalies.

A total of 228 magnetic anomalies were selected, 140 in area AB, 64 in area C and 24 in area D. Some of these will be the same anomalies registering on adjacent run lines. A handful of these anomalies were caused by iron objects on the seabed which we already know about. A simplified version of the magnetic target list is reproduced in appendix IV.

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[9] Comma Separated Values

[10] Nanotesla (nT) is a unit of magnetic flux density; 1 nT = 10^{-9} tesla

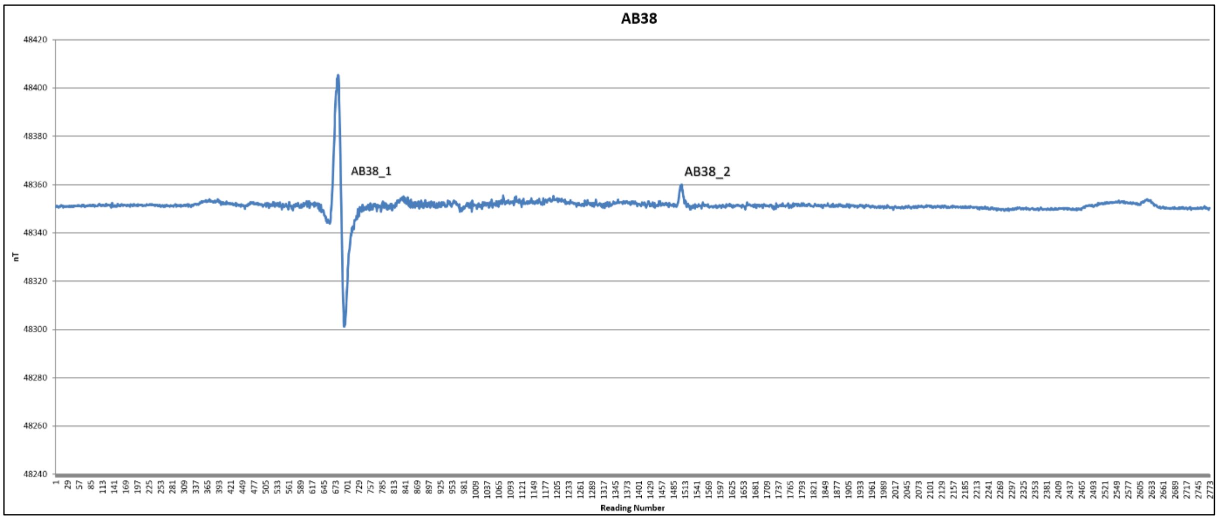


Fig 15
An example time series plot, in this case for runline AB38, the two magnetic anomalies chosen as targets were AB38_1 (105nT dipole) and AB38_2 (9nT positive spike) shown above.

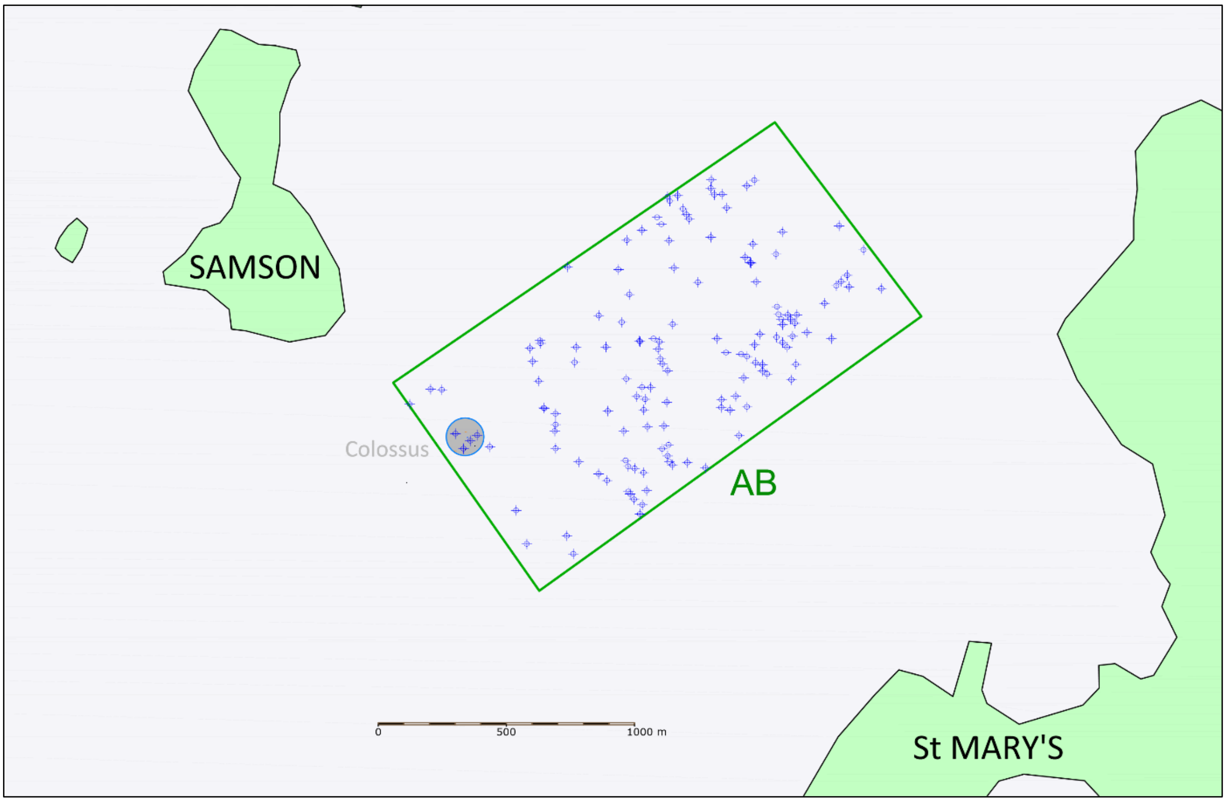


Fig 16
A plot showing the distribution of the magnetic targets selected in search area AB. The grey circle (150m in diameter) represents the area of the stern wreckage of *Colossus*. Search area AB was 1845m x 860m

Where magnetic anomalies appear close together on adjacent run lines, they may originate from the same object (or group of objects) on the seabed. These anomalies have all been noted in the target list in appendix IV. Similarly, where side-scan sonar targets are close to magnetic anomalies this indicates that the relevant side-scan target is probably composed of iron. This applies to 19 of the side-scan targets selected by Mark James (see appendix IV for concordances).

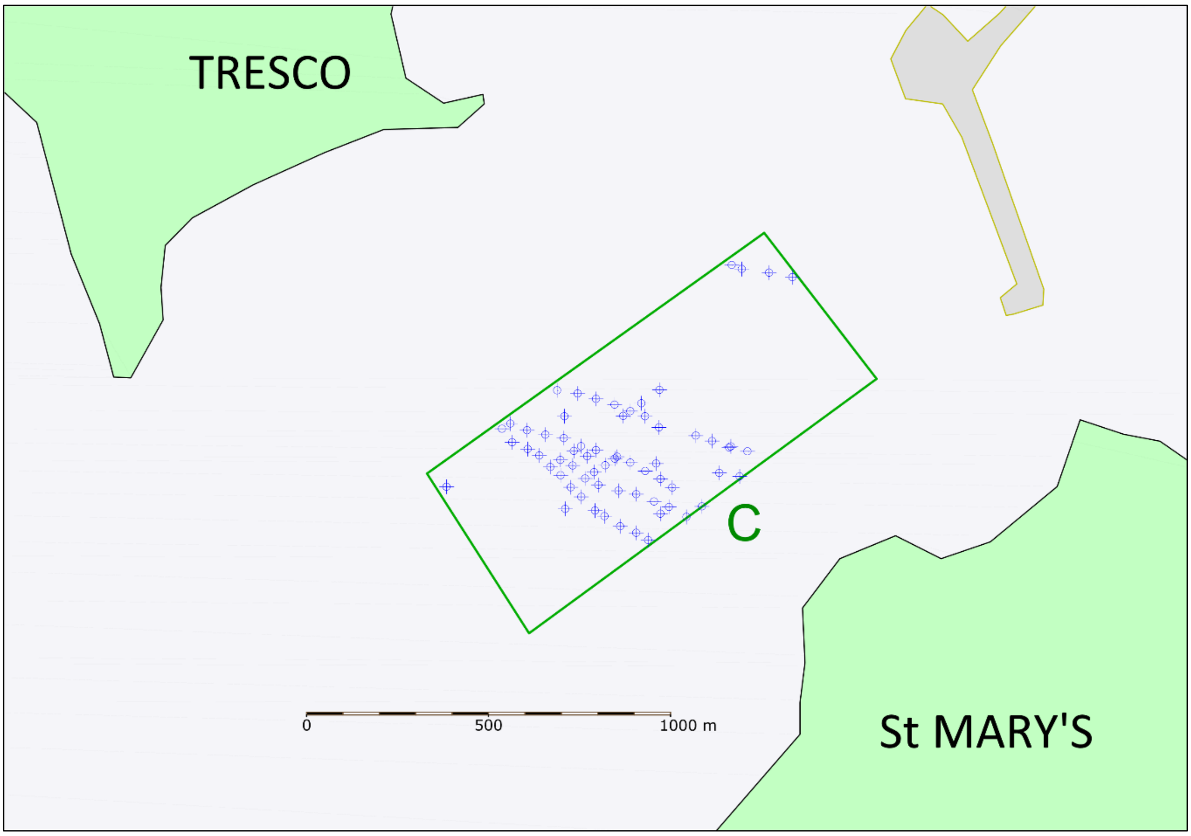


Fig 17
A plan showing the chosen magnetic targets in search area C. Search area C was 1185m x 530m

Area C was much shallower than area AB, with a water depth of between 4 and 7m when surveyed. What became apparent was that the magnetic data collected was dominated by electricity power cables running between the islands of St Mary's and Tresco. The lines of these power cables can be clearly seen in the anomaly plot of magnetic targets shown in **fig 17**, where at least five power cables have been detected. These cables were also evident on the side-scan sonar data. Although 64 magnetic anomalies were chosen from the data only four of them lie outside the lines indicating a power cable.

The 'noise' levels exhibited by this magnetic data are relatively low and will easily allow detection of smaller targets exhibiting an anomaly of 3-4 nT. Once the initial target set has been investigated, we intend to investigate some of these smaller magnetic anomalies.

Area D was originally planned to be to the east of area C, but it was decided to move this search area to cover the area of the western debris field. Although this had been searched in 2006, this investigation had been informed by magnetometer data alone. An additional side-scan sonar survey may detect previously unknown material in the western debris field.

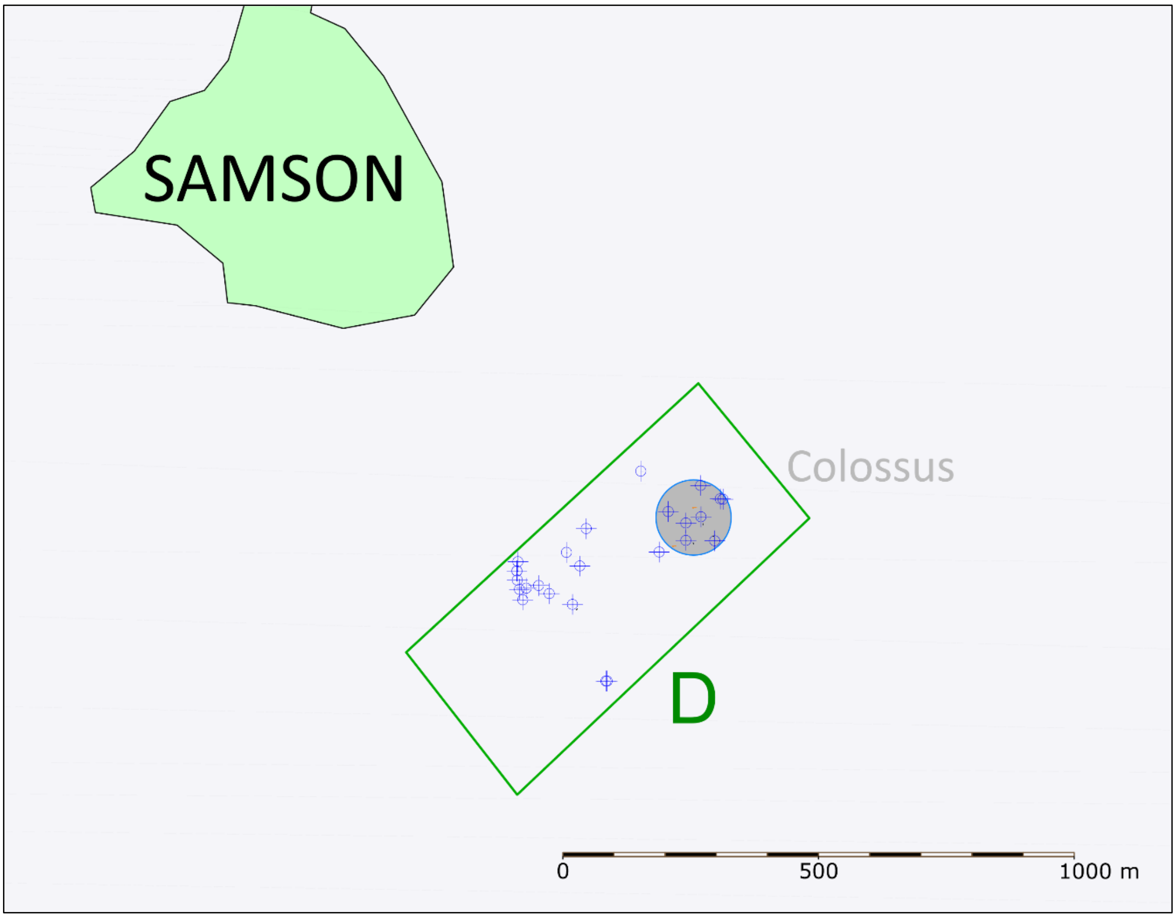


Fig 18

A plan showing the chosen magnetic targets in search area D. This area was 800m x 350m

Side-scan Sonar

Fig 19

Survey manager Mark James at work in the cabin of the survey vessel, recording the geophysical data.

The initial selection of side-scan sonar targets was made by Mark James. He chose a total of 52 targets: 44 in area AB, 8 in area D and none in area C.

Our plan after initial investigation of a selection of these targets is to continually re-evaluate the side-scan data. Different volunteers will be trained in side-scan data appraisal and target selection. By refining our interpretation of the data, diving the targets then reappraising the data we will refine our understanding of this data set. The usual workflow is data collection, target selection culminating with 'ground truthing' of a small selection of these targets. We are confident that our understanding of this data set will improve as we dive more of the targets, and develop the target selection process for this specific area of seabed, over a number of seasons.

The side-scan sonar data were collected using the C-Max software Maxview. The towfish layback and antennae offset were not input prior to data collection, as MSDS are accustomed to adding this in post processing. This works well, but in this case has resulted in XTF format files which cannot be accessed without proprietary software. This is a difficulty for our collaborative and ongoing scrutiny of the side-scan sonar data, but one which we hope will be resolved shortly.

The side-scan sonar targets (Mark James selections) are reproduced in appendix III, a few notable examples are reproduced below.

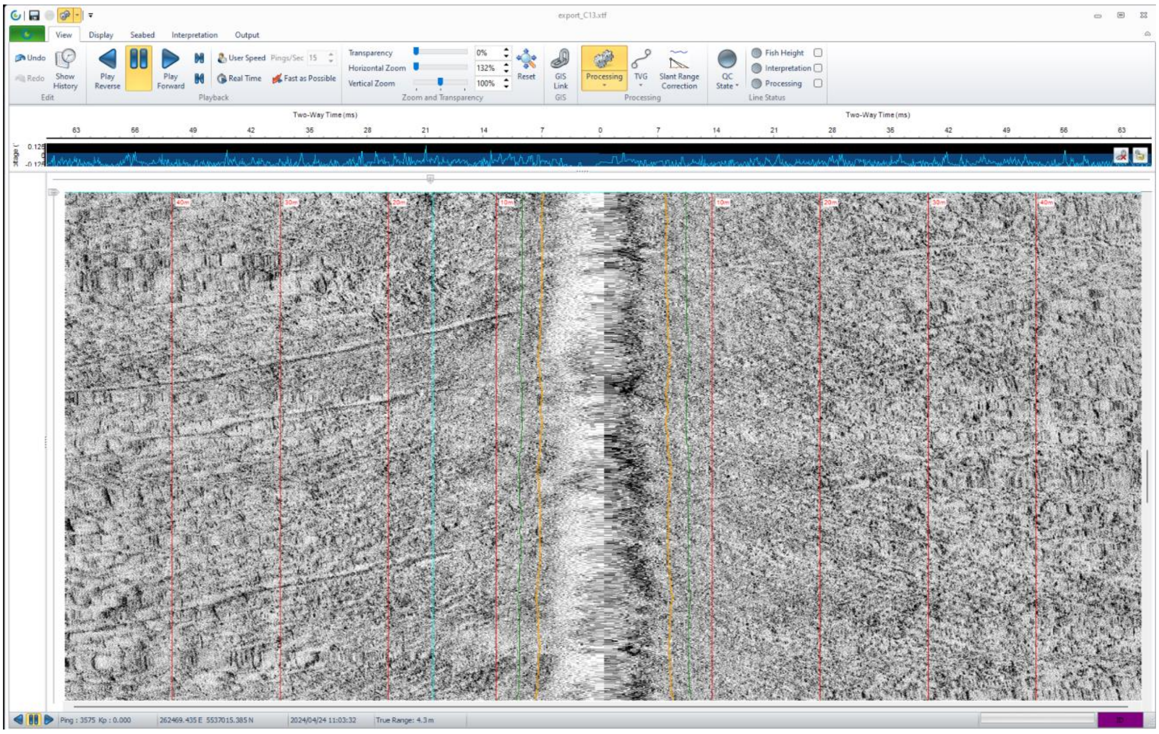


Fig 20

Side-scan sonar for runline C13 clearly showing three of the electricity cables on the seabed

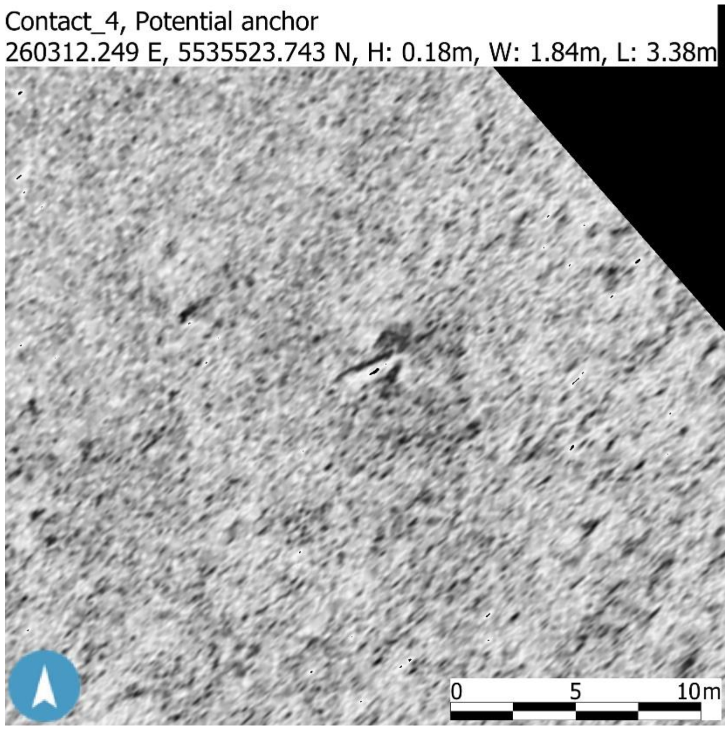


Fig 21

Debris located about 190m south east of the stern of *Colossus*. This target did not register on the magnetometer survey

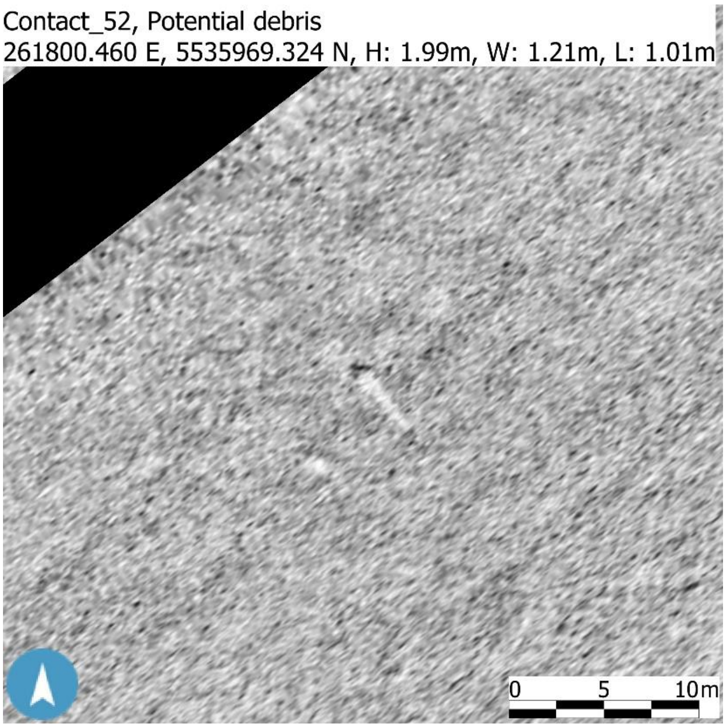


Fig 22

Debris located some 1.5 kilometres to the north east of the stern of *Colossus*. This item did not register on the magnetometer survey

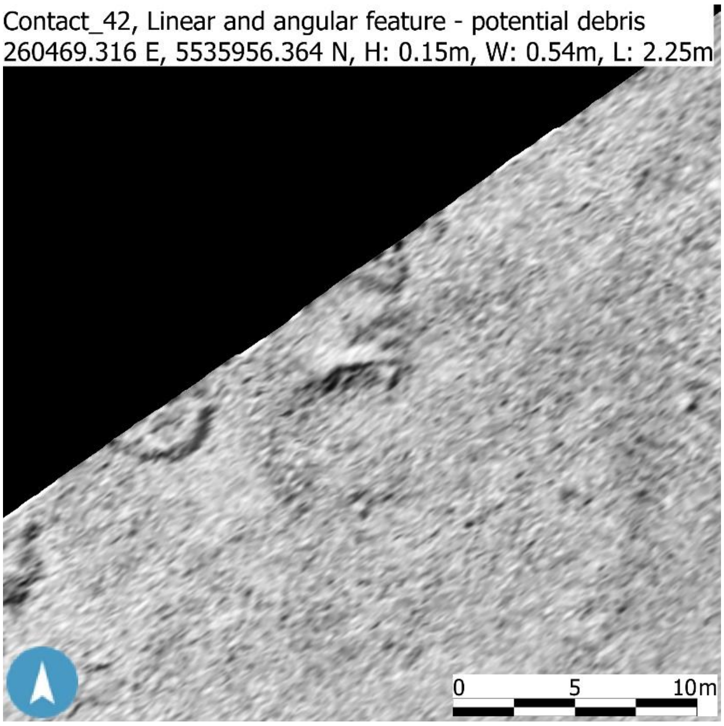


Fig 23

Debris located 500m to the east of the stern of *Colossus*. This debris also registered on the magnetometer survey (AB30_1 a 15nT dipole) suggesting that some of this debris is made of iron

Concordances

There are currently 19 targets which have been detected by the magnetometer and side-scan surveys. These targets are very likely to contain substantial iron components, and as such are likely to be artefacts. Three examples are illustrated below. All the concordances are recorded in the magnetometer target list in appendix IV.

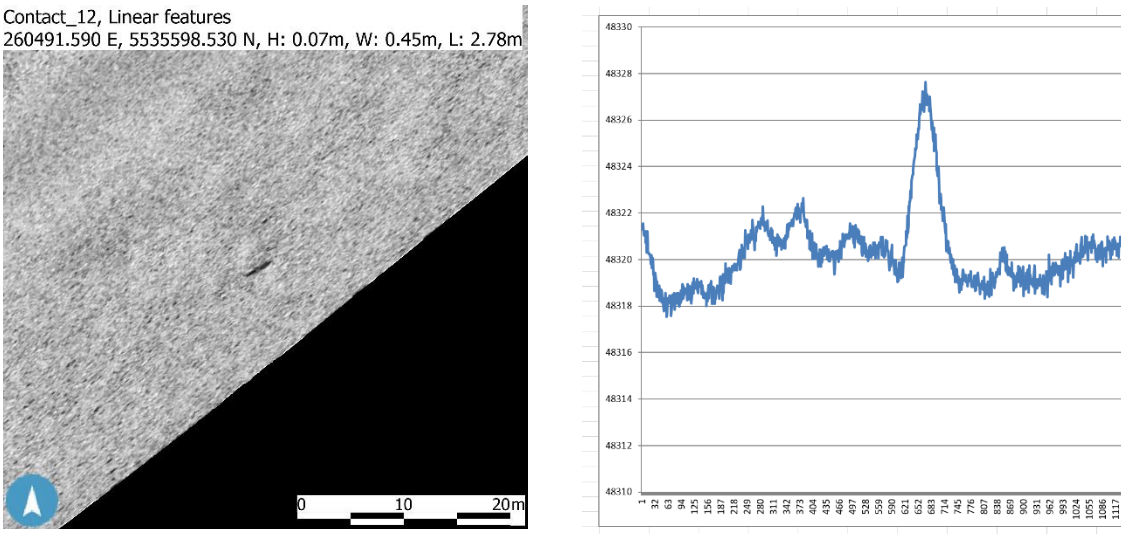


Fig 24
The same target detected by the side-scan sonar (left MJ12 – dark, long thin object with possible scour pit) and on the magnetometer time series plot (right AB18_1 – 6nT positive spike)

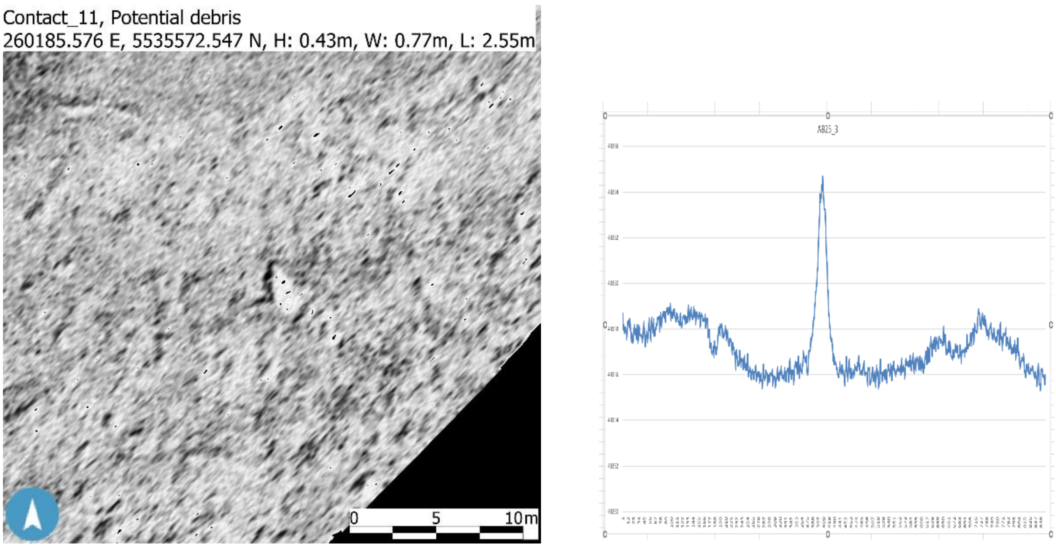
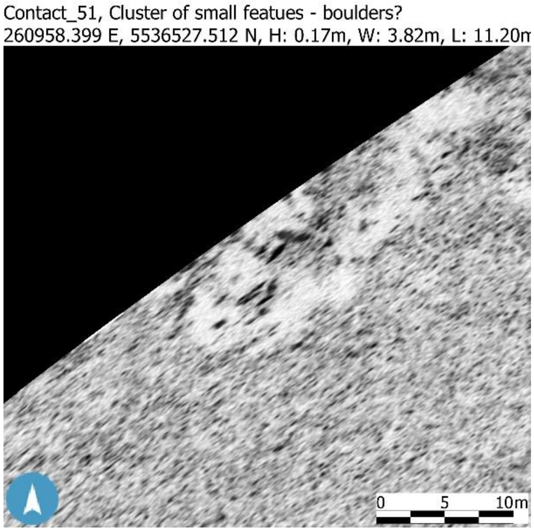


Fig 25
How the same anomaly appears on the side-scan sonar (left MJ11 – dark angular object with shadow) and on the magnetometer time series plot (right AB25_3 – 8nT positive spike)



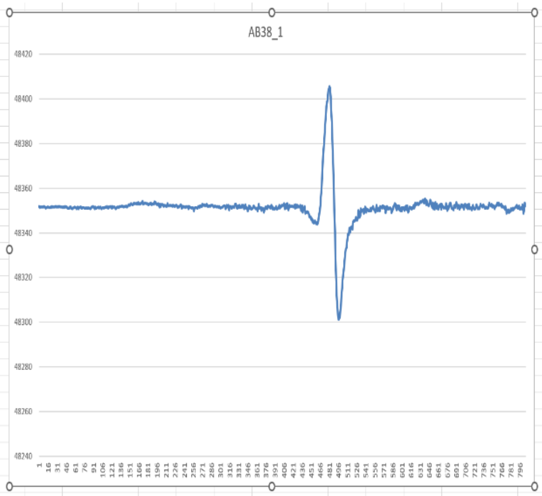


Fig 26

The same target on the side-scan sonar (left MJ51 – cluster of objects) and on the magnetometer time series plot (right AB38_1– a substantial 105nT, 6-12 tonne mass of iron)

Student Placement

A student placement was advertised offering practical experience in marine geophysical survey and analysis. There were 22 applicants from many different countries including Belgium, Germany, Israel, Lebanon, Malta, UK and USA. The successful applicant was Martin Davies, a protected wreck licensee and Nautical Archaeology Society (NAS) instructor. CISMAS has offered ‘trainee’ placements on a number of our previous projects where we were undertaking projects involving activities where it can be difficult to gain practical experience (for example properly recorded underwater excavation).

Conclusion

Now that the geophysical data have been successfully collected, it remains only to put it to use. CISMAS will be visiting the site this September and will begin investigation of the geophysical targets. This process will probably take some time to complete, and we hope it will provide a project to engage CISMAS volunteers for many years to come.

Volunteer Accounts

The CISMAS volunteers are all encouraged to contribute to the project report. Their accounts illustrate how rewarding community archaeology can be, and show that there are many different ways of appreciating and contributing to our rich archaeological heritage.

Pulling Strings (Nick Sodergren)

With no experience of working with side-scan sonar or magnetometer equipment, I was intrigued to see what lay ahead when I volunteered to assist with this marine geophysics project. To prepare myself a bit beforehand, I read material on developing magnetometer techniques (previously published on the CISMAS website) and this gave me a better understanding of this equipment and the terminology that I could expect to hear from the experts in our crew.

My role was a general 'deckhand' type position, mainly launching and recovering the expensive magnetometer and side-scan sonar equipment over the stern of the boat. Both pieces of equipment were towed behind the boat by their respective insulated cables, which I understood had an inner structural core to withstand the strain of towing. These cables were attached to each of the two stern posts with a 'Chicago grip', a metal clamp that gripped the cable tightly through a scissor design.

Fig 27

Nick recovers the magnetometer tow fish to the boat.

Drone photo by Martin Davies

I learned that the side-scan sonar and magnetometer 'towfish' needed to have some physical separation from each other, in order to prevent distortion of their data collection. This was achieved by having them towed from opposite corners of the stern, but also by setting the magnetometer cable much longer that the side-scan sonar cable, so that the magnetometer was always being towed further behind the boat. The distance from the stern to the towfish is referred to as 'layback'.
Data from both pieces of equipment would be recorded in conjunction with a GPS position (which was being fixed by a dedicated antenna attached to the top of the cabin). In order for the correct GPS position to be ascribed to the actual position of the side-scan sonar and magnetometer, it was essential to factor in the layback distances for both pieces of kit too. With this in mind, both cables were marked with coloured tape, in 5 metre increments. This enabled me to accurately pay out the right amount of cable to achieve the layback stipulated by the surveyors.

Once I had deployed both pieces of equipment into the water with the correct laybacks, the boat skipper had the unenviable task of steering straight courses along dozens of pre-agreed 'runlines', at the appropriate speed to gather the best quality of data, whilst not allowing the towed equipment to collide with features on the seabed. At the end of each runline, the skipper would make a wide turn and line up for the next run. This could allow the equipment to sink as it slowed down during the turns, so I would need to stand ready at the stern and haul in some cable if required.

Occasionally it was also necessary for me to retrieve the side-scan sonar (which operated at a much lower 'altitude' than the magnetometer) in between runs, to clear from it an accumulation of seaweed which would impair the data quality.

We were blessed with quite flat sea conditions for our survey, which made launching and recovering the heavy equipment from a small stern platform relatively easy. I'm sure that in a 'lumpy' sea this would have been more challenging!

Missing The Boat (Sharon Austin)

I had been tasked with taking photographs of the survey in progress. As a self-taught amateur photographer, I am always up for a challenge and this project presented me with one.

The evenings were spent studying the charts and conferring with the team as to the area where they would be surveying the following day, in order to choose a suitable vantage point on land with sufficient elevation. My plan did not always work out and I missed the survey boat on several occasions and one day I even had the wrong lens for the required task.

I took advantage of a return trip from Tresco to St Marys on the inter-island boat, to capture images of the survey in action, a fortunate opportunity indeed.

With my camera being digital I was able to manage with the constantly changing light conditions and with my 'birding lens' I succeeded in a few pleasing results even though the survey boat was always a considerable distance away. As usual I thoroughly enjoyed taking part in the project.

Fig 28
Survey underway in area AB. Photo by Sharon Austin

Learning Curve (Martin Davies)

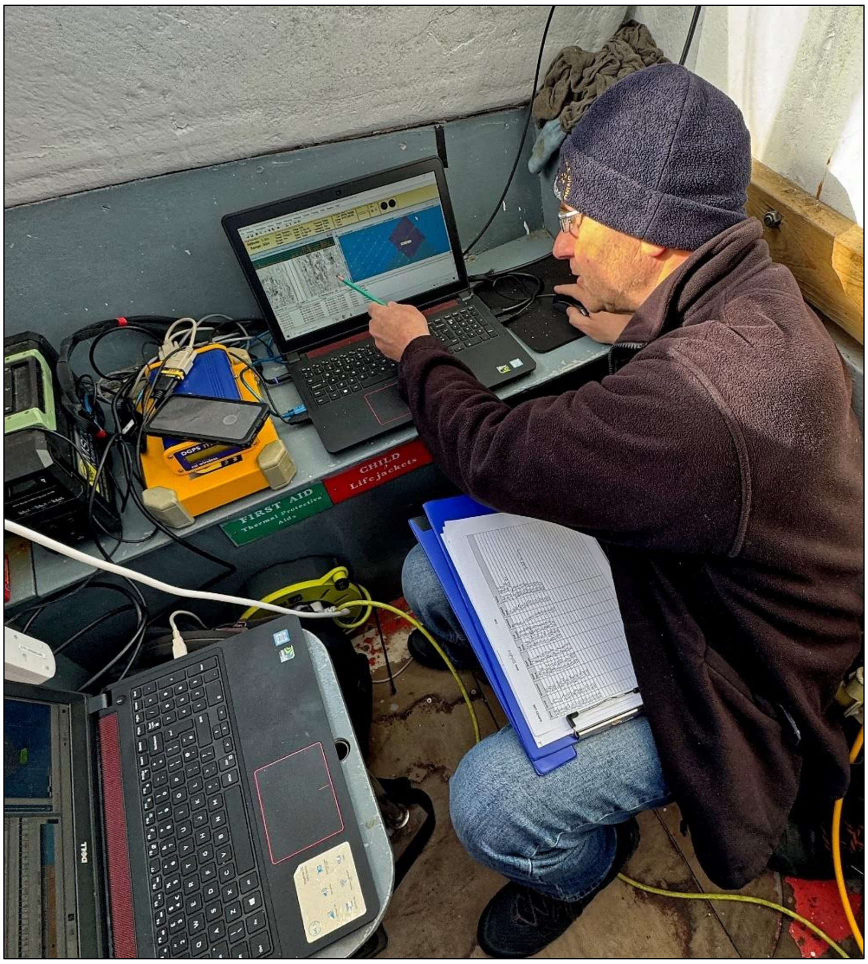


Fig 29

Martin Davies overseeing data collection on board *Kestrel*

It’s not every day that you get to go on a proper geophysical survey and see how it is all done. I felt so pleased when I was told that I had the place to help and get involved with the survey of the Colossus.

Just like diving, there is lots of heavy equipment in boxes - and this all had to be transported over to the islands, initially by ferry and then by our survey boat for the week. Mark James headed up the survey and he was to be my mentor for the week. Mark has done many surveys, and he has a good knowledge of the equipment and the software. After initial setup and plugging everything together a few hours later we were able to begin some test runs with our skipper Adam, who knew his boat well and once he understood what he needed to do, helmed his boat and the survey gear in some remarkably straight lines. Our equipment (a C-MAX side-scan sonar system and SeaSPY magnetometer, a couple of laptops and power sources, along with a DGPS) all came together to begin generating ‘bottom data’.

We were blessed with some unusually calm weather in the area where Colossus is. This made the data acquisition much easier than it would have been with a strong wind. Mark James had already programmed into the C-Max software the four new areas (boxes), going beyond the wreck itself and focusing on areas that had not been looked at before.

What was very apparent is that to collect the data you need a small team; a couple of deck hands a good skipper and a surveyor to run the job. All these elements must function as one once the survey gets underway. I was pleased to be involved and eventually controlling the running of the lines once the survey got on the way. It was a real hands-on experience, one that I hope I can utilise again in the near future.

There was a lot of concentration required; focusing on the laptop screens and recording the lines of data individually from both side-scan and magnetometer at the same time and making sure that all the lines were covered so that we had 100 percent coverage of the area. There was also a requirement to make a note of anything interesting seen on either of the screens, whether that be a stronger magnetometer target or an interesting shape from the side-scan. I found this part very interesting, to see the picture of the seabed revealed bit by bit. The whole bunch of data files would eventually be combined into one large file using a proprietary piece of software called Sonarwiz.

Our deck hands Nick and Kevin worked hard deploying and retracting the cables as required. This was all controlled by the speed of the boat and the depth of the water. The ultimate aim was to get the sonar as close as possible to the seabed, but not so close that the very expensive side-scan snagged anything sticking up. Not only would that be very costly in damage to the probe, it could ruin the rest of the data acquisition. So, I have learnt that this is part of the skill of the surveyor - maintaining the sonar at the optimum height above the seabed whilst keeping an eye on the seabed depth, adjusting the boat speed for best data acquisition, and changing the layback for the probes if necessary. Lots to think about when the topology is not just a flat seabed!

This was a great opportunity and learning experience for myself and I thank Kevin Camidge and Historic England for that, and I really hope that I can put into practice some of the skills and techniques that were used on the survey soon.

Appendix I - Data collection methodology (Mark James)

Data collection

The survey was conducted by MSDS Marine Ltd (MSDS Marine) and Cornwall and Isles of Scilly Maritime Archaeology Society (CISMAS) between 21st April and 24th April 2024. The survey spread consisted of side-scan sonar (SSS) and magnetometer and comprised 97.8 line kilometres (lkm) of data.

The SSS and magnetometer were towed behind the vessel, the SSS from the starboard stern post, and the magnetometer from the port stern post. Survey operations were conducted from *Kestrel*, a vessel of opportunity based on St Martins, and mobilised for survey operations.

Survey operations were undertaken within the extents of four pre-defined survey areas (A, B, C, and D). The combined area of the four survey areas totalled c. 2.3 km^2, of which c. 0.04 km^2 (c. 1.7%) could not be surveyed due to upstanding features or shallow water.

The SSS and magnetometer data were collected concurrently to a pre-defined line plan of 25 m, with the exception of Area C to the northwest which was collected at 40 m. The survey lines were followed by the vessel master with the use of a secondary monitor positioned at the helm. Where lines deviated to an extent where 200% coverage would not be achieved, they were re-run.

The range of the SSS was set to 50 m, thus ensuring that 200% coverage (including the nadir) was achieved. The SSS survey was predominantly undertaken at 325 kHz, which provides an optimal combination of range and resolution, and the data from which is less susceptible to noise. An altitude of less than 10% of the range was aimed for across the survey areas, but took into consideration seabed topography along the length of the survey lines. The magnetometer data were collected at a frequency of 4 Hz (four readings every second), and an altitude of less than 10 m was aimed for, again taking into consideration the topography along the length of the survey lines.

The equipment specification is presented in Table 1 below.

Sensor	Manufacturer	Model	Frequency
Side-scan Sonar	CMAX	CM2	325/780 kHz
Magnetometer	Marine Magnetics	SeaSPY2	4 Hz sample rate

Table 1: Geophysical sensor specifications

The data were collected to a specification appropriate to achieve the following interpretation requirements:

Side-scan sonar: ensonification of anomalies > 0.5 m
Magnetometer: 5.0 nT threshold for anomaly picking

Positioning

All data were collected with reference to the World Geodetic System 1984 (WGS84) datum and Universal Transverse Mercator (UTM) Zone 30 North projection (WGS84 Z30N).

The SSS and magnetometer were positioned using layback calculations. The calculation of layback involve the measurement of the x,y offset between the tow point and the GNSS antenna, and the amount of tow cable out. The layback, and therefore the sensor position, is calculated by the processing software used. Whilst there are inherent inaccuracies with the use of layback calculations, including the impacts of speed, current direction, etc. a reasonable approximation of position can be achieved. The accuracy of the positions can be further increased through the identification of the same anomaly on multiple lines of data. GNSS data were collected at 1 Hz (one reading every second).

During post processing, visible features (such as cables spanning multiple lines) correlated well across lines, and within the magnetometer data. The positioning error is estimated at +/- 2.5 m.

Surface position sensors specifications are detailed below in Table 2 below.

Sensor	Manufacturer	Model	Accuracy
GNSS	CSI Wireless	DGPS Max	<1.0 m

Table 2: Position sensor specifications

Data collection software

The SSS were collected using CMAX MaxView software, the data were collected in .CM2 format, and exported in the industry standard format .xtf. The data were collected without the application of layback as MaxView does not allow the alteration of layback during post processing and it is likely adjustments would need to be made during post processing. Layback corrections were made in Moga Seaview. MaxView was also used for survey navigation.

The magnetometer data were collected using Marine Magnetics BOB software, and exported as comma delimited text files (.csv)

Data quality and limitations

Side-scan Sonar (SSS)

The SSS data achieved 200% coverage across 98.3% of the survey areas. The remainder were not able to be surveyed due to upstanding features, or shallow water. The data collected at 325 kHz were generally of good quality and free from interference, however in areas the assessment was hampered by the presence of geological features which can obscure small features. Typically, this is mitigated through the collection of 200% coverage SSS data, ensuring that the seabed is ensonified from two directions.

The data collected at 780 kHz (only over the wreck) were of good quality but regular interference was noted, likely due to vessel engine.

Magnetometer

Magnetometer data were collected along the same lines, and areas, as the SSS data and therefore have the same limitations in terms of coverage. Overall, the data were of good quality, with noise largely not exceeding +/- 2 nT, and the data were suitable to identify anomalies with a peak-to-peak amplitude of 5.0 nT. The altitude of c. 10 m (although less in areas) will increase the minimum object detection (MOD) size under the sensor, which in turn increase with distance from the sensor.

The seabed within the assessment area varies, and largely comprises variations of sand, silt and gravel (The seabed form across the assessment area is characterised by broadly flat seabed, ripples, and mega ripples). Prominent features, such as sand waves, can cause obstructions to the line of sight of sonar data, in particular the SSS, the data from which is collected closer to the seabed. Typically, this is mitigated through the collection of 200% coverage SSS data, ensuring that the seabed is ensonified from two directions. The SSS coverage of 200 - 300% is considered appropriate to undertake a robust assessment.

Summary

The data collected across the extents of the survey area were of good quality overall and provided good coverage of the seabed. The data are considered of an appropriate specification, coverage, and quality, to undertake a robust archaeological assessment prior to ground truthing.

Archaeological assessment of data

The archaeological assessment of data was undertaken by qualified and experienced maritime archaeologists with a background in geophysical data acquisition, processing, and interpretation.

Side-scan Sonar

SSS is considered the best tool for the identification of anthropogenic anomalies on the seabed due to its ability to ensonify small features, and as such forms the basis of any archaeological assessment of data. SSS data in .xtf format were imported into Moga SeaView software, navigation and positioning were checked and corrected where required, and optimal gains were applied to ensure the consistent presentation of data.

Data were reviewed on a line-by-line basis, and all anomalies of potential anthropogenic origin identified and recorded. Records include at a minimum an image of the anomaly, dimensions, and a description.

Following assessment of the individual lines, a mosaic was created and a geotiff exported to allow for the checking of positional accuracy and to identify the extents of any anomalies that may have extended past the limits of individual lines.

Magnetometer

Magnetometer data indicate the presence of ferrous, and thus usually anthropogenic, material both on and under the seabed. Where possible, magnetic anomalies were correlated with anomalies visible on the seabed.

Magnetometry data as .csv files were imported into Moga SeaView 5.2.80 software where the data were smoothed, and a ‘baseline’ identified and removed from the data to highlight ferrous anomalies whilst taking into account geological variations in the data.

Magnetic anomalies identified within the data had the position, amplitude and dimensions recorded, and a calculation of ferrous mass was undertaken. The data were gridded to visually identify areas where the distribution of anomalies may represent a wider feature such as a buried but dispersed wreck, or modern features such as buried cable or chain.

Combined assessment

Following the assessment of all datasets the results were imported into Geographical Information System (GIS), and reviewed alongside each other, along with geotiffs of the SSS and magnetometer data. The concurrent review allows the amalgamation of duplicate anomalies, the assessment of the wider context, and an understanding of the extents of a feature that may be partially buried or span across two or more lines of data.

The interpretation of geophysical and hydrographic data is, by its very nature, subjective. However, with experience and by analysing the form, size, and characteristics of an anomaly, a reasonable degree of certainty as to the origin of an anomaly can be achieved.

Measurements can be taken in most data processing software, and whilst largely accurate, discrepancies can be noted due to a number of factors. Where there is uncertainty as to the potential of an anomaly, or its origin, a precautionary approach is always taken.

It should be noted that there may be instances where an anomaly may exist on the seabed but not be visible in the geophysical data. This may be due to its being covered by sediment or obscured from the line of sight of the sonar

Appendix II – Survey Log Sheet

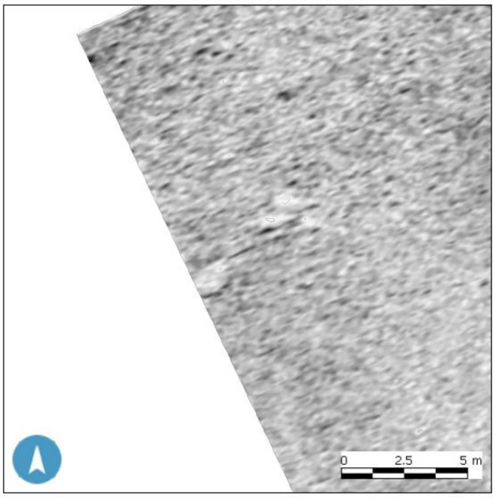
SURVEY LOG Date 21 April 2024 Tide

Line 1 to Re-Run

Area	Line#	Direction	Start Time	Start Depth	End Time	End Depth	Layback SS	Layback Mag	Notes
AB	Line 1	NE	14·56	14M	15.07	9·8	15	20	Line 1 = AB 22
AB	Line 2	SW	15·09	9·8M	15-20	14·1	15	20	Line 2 = AB 27
AB	Line 3	NE	15·25	14·5M	15-36	8M	15	20	Line 3 = AB29
AB	Line 4	SW	15·38	10·8M	15-49	12·8M	15	20	Line 4 = AB30 One North of 29
AB	Line 5	NE	15·52	14·6M	16-01	10·3M	15	20	Line 5 = AB25 4 South of 29
AB	Line 6	SW	16·20	8·8M	16-31	12·4	15	20	Line 6 = AB 38
AB	Line 7	NE	16·32	12·9M	16·45	8·7	15	20	Line 7 = AB 36
AB	Line 8	SW	16-47	10·1M	16·58	12·6	15	20	Line 8 = AB 34
AB	Line 9	NE	17-00	14·2M	17-13	10·1	15	20	Line 9 = AB 32
AB	Line 10	SW	17·16	10·4M	17·27	15·2	15	20	Line 10 = AB 25 (252)
AB	Line 11	NE	17-29	16·6M	17-43	10·5	15	20	Line 11 = AB 20
				22	April	2024			
AB	Line 12	SW	10·06	8·2	10·17	16·7	15	20	Line AB0
AB	Line 13	NE	10·20	14·2	10·35	7·8	15	20	Line AB2
AB	Line 14	SW	10·36	7·7	10·47	16·0	15	20	Line AB4 Missed 15m Start
AB	Line 15	NE	10-49	15·2	11-02	7·0	15	20	Line AB 6
AB	Line 16	SW	11·04	6·8	11·09	7·0	15	20	Line AB 8 Aborted Line
AB	Line 17	SW	11·10	6·8	11·20	15·8	15	20	Line AB 8-2
AB	Line 18	NE	11·21	15·3	11·35	6·8	15	20	Line AB 10
AB	Line 19	SW	11·36	7	11-46	15·2	15	20	Line AB 12
AB	Line 20	NE	11-48	15·0	12-00	7·3	15	20	Line AB 14
AB	Line 21	SW	12·02	7·3	12·12	14·8	15	20	Line AB 16
AB	Line 22	NE	12·14	14·1	12:26	6·8	15	20	Line AB 18
AB	Line 23	SW	12·28	7·8	1240	16·0	15	20	LINE AB 1
AB	24	NE	12·42	15·9	12·55	8·3	15	20	LINE AB 3
AB	25	SW	12:57	8·0	1310	16·9	15	20	LINE AB 5
AB	26	NE	1311	16·3	1323	8·1	15	20	LINE AB 7
"	27	SW	1325	8·1	1339	17·0	15	20	LINE AB9
AB	28	NE	1341	16·8	1353	8·7	15	20	LINE AB11
AB	29	SW	1355	8·8	1410	17·1	15	20	LINE AB 13

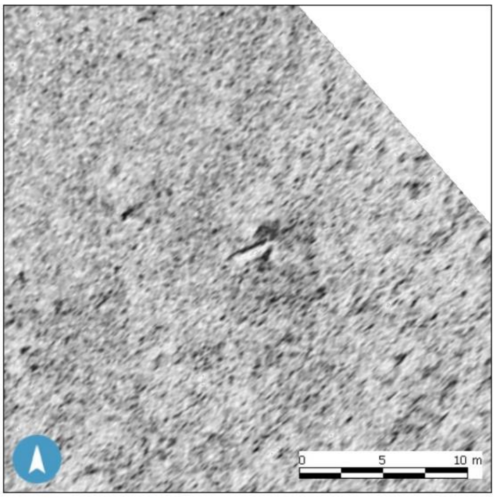
An example of the CISMAS survey log sheets used to record the parameters for each of the run lines

Appendix III – Side-scan Sonar Targets (Mark James)



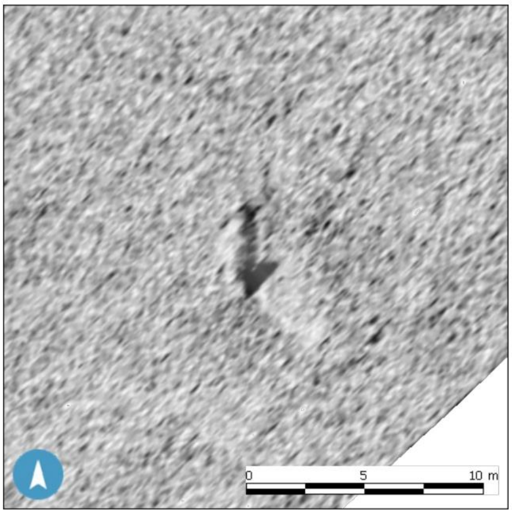
Heading: 64.67 °
Date-time: 23/04/2024 10:19:32.071

Name:	Contact_3
Class:	Potential debris
Easting:	259781.368
Northing:	5535127.001
Latitude:	49.920181856 N
Longitude:	6.346655905 W
Height:	0.14 m
Width:	1.79 m
Length:	5.66 m
Depth:	17.37 m
Shadow length:	0.33 m
Image:	D1-2_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	38.88 m
Altitude:	17.37 m



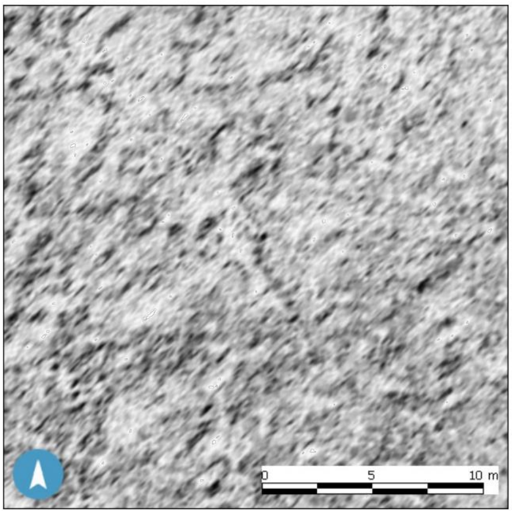
Heading: 48.74 °
Date-time: 23/04/2024 10:25:21.750

Name:	Contact_4
Class:	Potential anchor
Easting:	260312.249
Northing:	5535523.743
Latitude:	49.923957197 N
Longitude:	6.339519471 W
Height:	0.18 m
Width:	1.84 m
Length:	3.38 m
Depth:	13.76 m
Shadow length:	0.39 m
Image:	D1-2_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-27.91 m
Altitude:	13.76 m



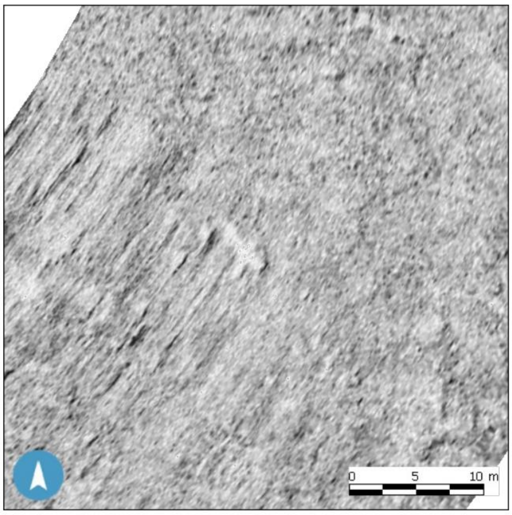
Heading: 46.78 °
Date-time: 23/04/2024 10:35:15.416

Name:	Contact_5
Class:	Potential anchor
Easting:	260000.849
Northing:	5535279.112
Latitude:	49.921635774 N
Longitude:	6.343698235 W
Height:	0.39 m
Width:	1.70 m
Length:	3.90 m
Depth:	15.76 m
Shadow length:	0.99 m
Image:	D3_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-39.25 m
Altitude:	15.76 m



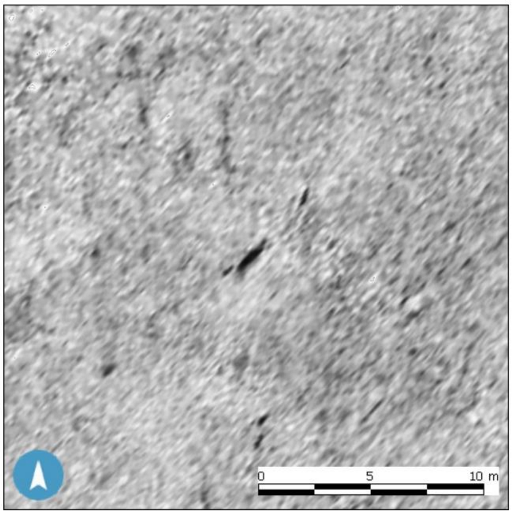
Heading: 46.03 °
Date-time: 23/04/2024 10:37:49.357

Name:	Contact_6
Class:	Potential debris
Easting:	260171.914
Northing:	5535539.793
Latitude:	49.924045035 N
Longitude:	6.341481183 W
Height:	0.16 m
Width:	2.25 m
Length:	5.93 m
Depth:	13.12 m
Shadow length:	0.45 m
Image:	D3_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	32.74 m
Altitude:	13.12 m



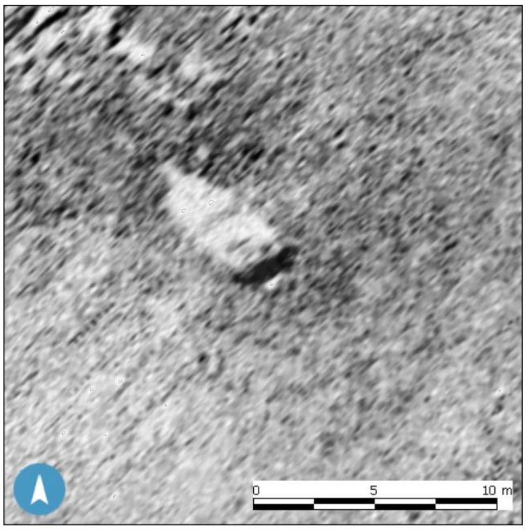
Heading: 213.66 °
Date-time: 23/04/2024 10:27:21.357

Name:	Contact_7
Class:	Upstanding feature
Easting:	260214.833
Northing:	5535547.752
Latitude:	49.924133715 N
Longitude:	6.340889219 W
Height:	1.85 m
Width:	1.88 m
Length:	1.46 m
Depth:	14.14 m
Shadow length:	4.55 m
Image:	D2_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-28.93 m
Altitude:	14.14 m



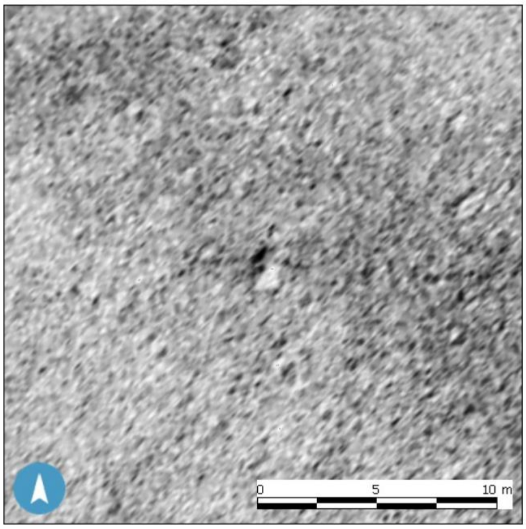
Heading: 223.58 °
Date-time: 23/04/2024 10:29:58.666

Name:	Contact_8
Class:	Linear features
Easting:	259988.624
Northing:	5535249.073
Latitude:	49.921361147 N
Longitude:	6.343849570 W
Height:	0.24 m
Width:	0.72 m
Length:	5.39 m
Depth:	17.22 m
Shadow length:	0.42 m
Image:	D2_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	25.05 m
Altitude:	17.22 m



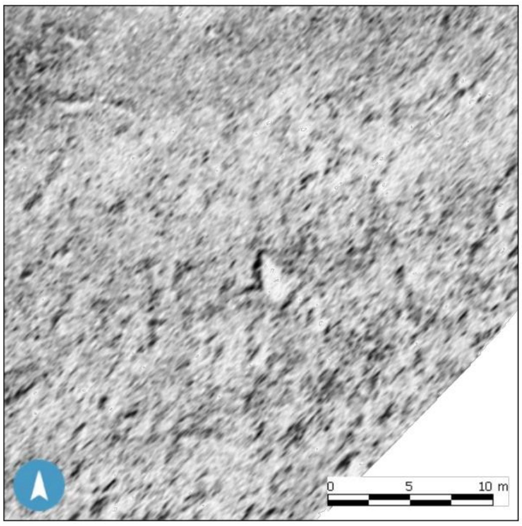
Heading: 46.84 °
Date-time: 23/04/2024 10:50:31.571

Name:	Contact_9
Class:	Potential debris
Easting:	259963.414
Northing:	5535405.366
Latitude:	49.922754360 N
Longitude:	6.344297345 W
Height:	2.54 m
Width:	1.06 m
Length:	2.89 m
Depth:	14.83 m
Shadow length:	5.94 m
Image:	D5_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	27.03 m
Altitude:	14.83 m



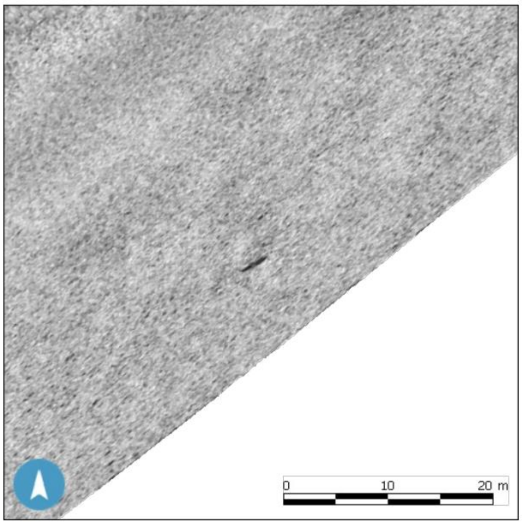
Heading: 46.35 °
Date-time: 23/04/2024 10:50:30.000

Name:	Contact_10
Class:	Potential debris
Easting:	259996.043
Northing:	5535366.238
Latitude:	49.922416135 N
Longitude:	6.343819234 W
Height:	0.48 m
Width:	0.88 m
Length:	1.73 m
Depth:	14.87 m
Shadow length:	0.98 m
Image:	D5_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-26.23 m
Altitude:	14.87 m



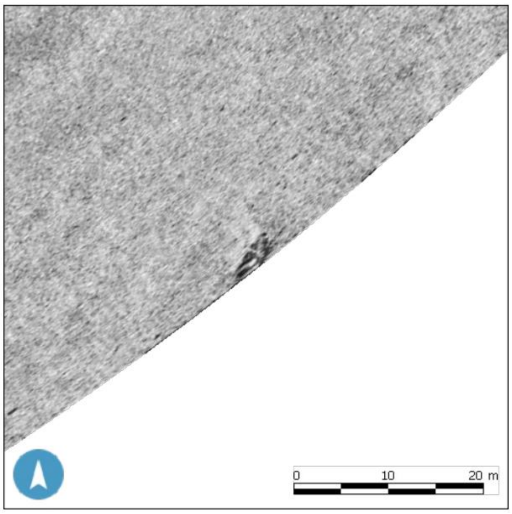
Heading: 224.37 °
Date-time: 23/04/2024 10:55:30.357

Name:	Contact_11
Class:	Potential debris
Easting:	260185.576
Northing:	5535572.547
Latitude:	49.924344606 N
Longitude:	6.341311526 W
Height:	0.43 m
Width:	0.77 m
Length:	2.55 m
Depth:	12.98 m
Shadow length:	1.31 m
Image:	D6_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	36.25 m
Altitude:	12.98 m



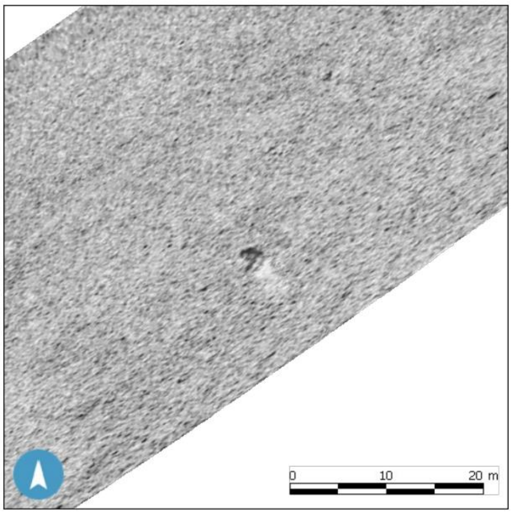
Heading: 51.12 °
Date-time: 21/04/2024 17:32:12.153

Name:	Contact_12
Class:	Linear features
Easting:	260491.590
Northing:	5535598.530
Latitude:	49.924700578 N
Longitude:	6.337071637 W
Height:	0.07 m
Width:	0.45 m
Length:	2.78 m
Depth:	16.56 m
Shadow length:	0.18 m
Image:	AB20_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-42.25 m
Altitude:	16.56 m



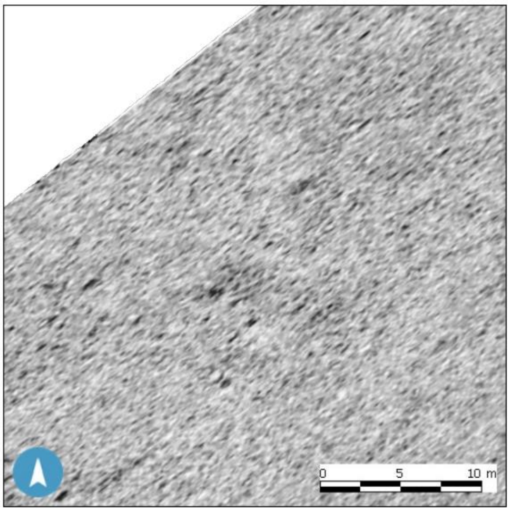
Heading: 51.24 °
Date-time: 21/04/2024 17:34:26.500

Name:	Contact_13
Class:	Potential debris
Easting:	260717.370
Northing:	5535746.160
Latitude:	49.926116547 N
Longitude:	6.334023007 W
Height:	0.11 m
Width:	2.40 m
Length:	5.48 m
Depth:	15.16 m
Shadow length:	0.37 m
Image:	AB20_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-48.95 m
Altitude:	15.16 m



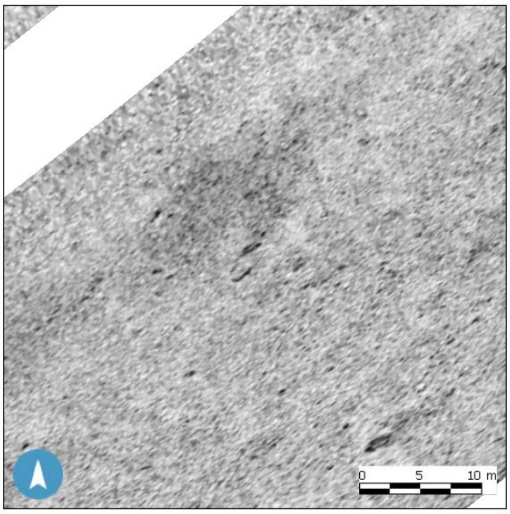
Heading: 55.02 °
Date-time: 21/04/2024 15:02:19.642

Name:	Contact_14
Class:	Likely geological
Easting:	260950.470
Northing:	5535980.880
Latitude:	49.928317344 N
Longitude:	6.330926334 W
Height:	0.80 m
Width:	1.69 m
Length:	2.95 m
Depth:	17.47 m
Shadow length:	1.96 m
Image:	AB22-1_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-38.45 m
Altitude:	17.47 m



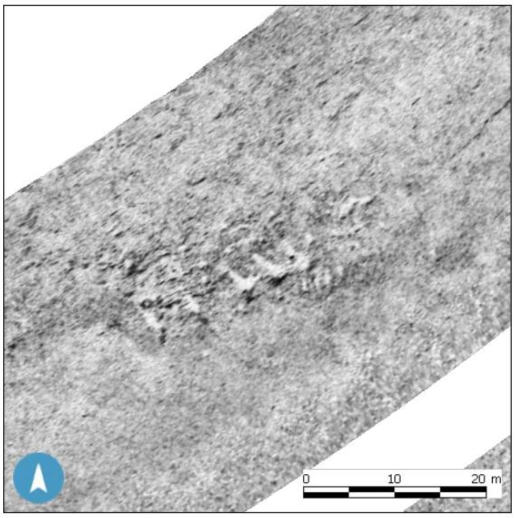
Name:	Contact_15
Class:	Four parallel linear features
Easting:	261083.018
Northing:	5536106.789
Latitude:	49.929500873 N
Longitude:	6.329160662 W
Height:	2.55 m
Width:	9.30 m
Length:	17.15 m
Depth:	18.09 m
Shadow length:	3.12 m
Image:	AB20_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-19.64 m
Altitude:	14.45 m

Heading: 57.70 °
Date-time: 21/04/2024 17:36:37.583



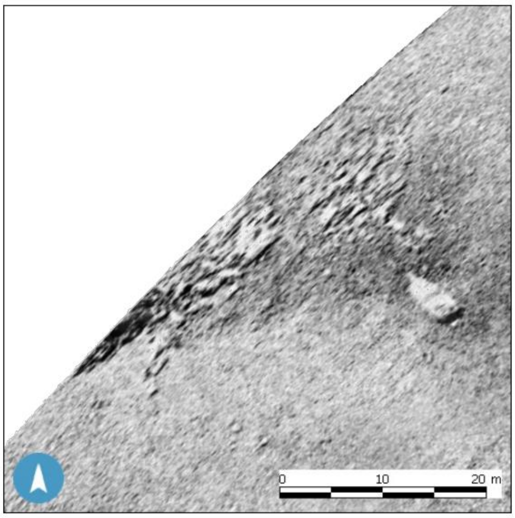
Name:	Contact_16
Class:	Likely geological
Easting:	260965.120
Northing:	5536099.370
Latitude:	49.929387118 N
Longitude:	6.330795965 W
Height:	0.53 m
Width:	8.65 m
Length:	19.03 m
Depth:	15.31 m
Shadow length:	0.91 m
Image:	AB25_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	22.10 m
Altitude:	15.31 m

Heading: 231.47 °
Date-time: 21/04/2024 17:20:36.153



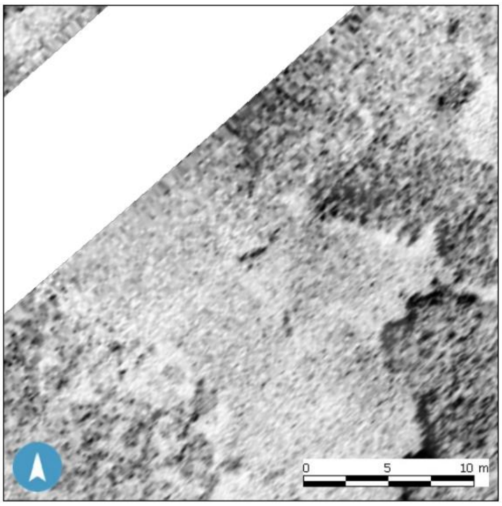
Heading: 236.64 °
Date-time: 21/04/2024 17:16:43.076

Name:	Contact_17
Class:	Wreck
Easting:	260152.640
Northing:	5535580.860
Latitude:	49.924406035 N
Longitude:	6.341774759 W
Height:	0.89 m
Width:	10.60 m
Length:	29.74 m
Depth:	4.75 m
Shadow length:	3.37 m
Image:	AB25_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	29.52 m
Altitude:	13.52 m



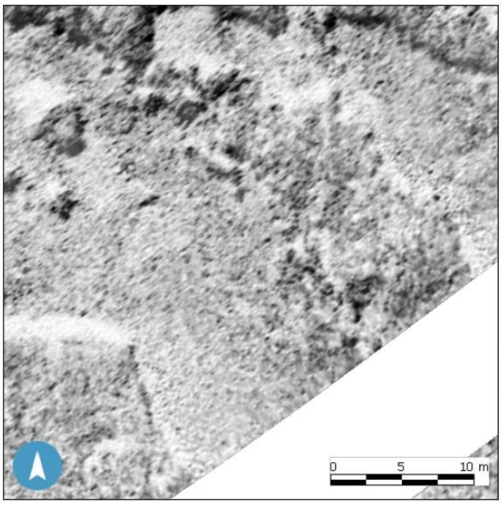
Heading: 45.49 °
Date-time: 23/04/2024 10:50:27.384

Name:	Contact_18
Class:	GUN 10?
Easting:	259944.995
Northing:	5535410.762
Latitude:	49.922795417 N
Longitude:	6.344556859 W
Height:	0.19 m
Width:	0.69 m
Length:	4.61 m
Depth:	14.97 m
Shadow length:	0.58 m
Image:	D5_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	44.51 m
Altitude:	14.97 m



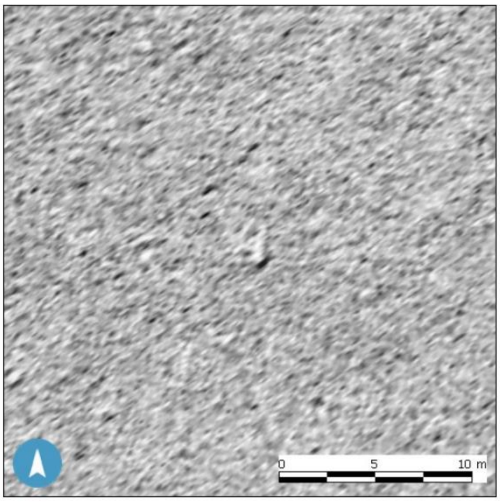
Name: Contact_31
Class: Linear feature amongst geology
Easting: 261311.754
Northing: 5536214.297
Latitude: 49.930557564 N
Longitude: 6.326045552 W
Height: 0.34 m
Width: 0.49 m
Length: 1.88 m
Depth: 13.36 m
Shadow length: 0.45 m
Image: AB20_CH[1_2]
Not measurable height: No
Report use: Yes
Range: -12.00 m
Altitude: 13.36 m

Heading: 49.05 °
Date-time: 21/04/2024 17:40:25.857



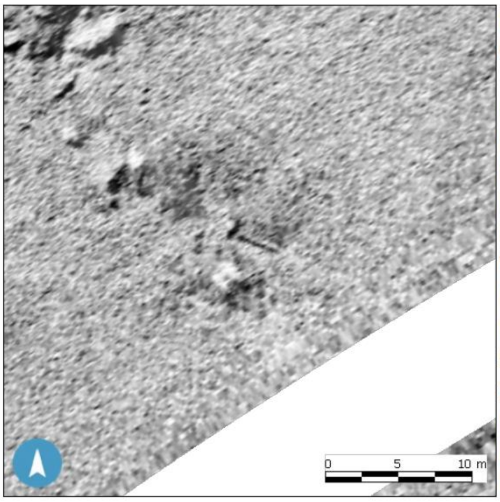
Name: Contact_32
Class: Feint linear feature amongst geology
Easting: 261386.885
Northing: 5536303.970
Latitude: 49.931392736 N
Longitude: 6.325055954 W
Height: 0.00 m
Width: 0.46 m
Length: 2.67 m
Depth: 13.13 m
Shadow length: 0.00 m
Image: AB20_CH[1_2]
Not measurable height: Yes
Report use: Yes
Range: 16.11 m
Altitude: 13.13 m

Heading: 54.30 °
Date-time: 21/04/2024 17:41:20.500



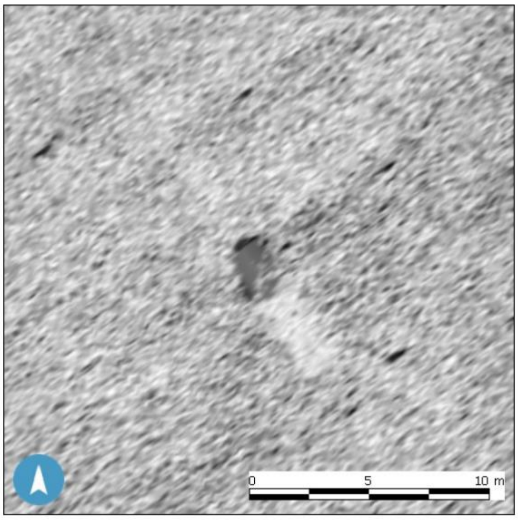
Name: Contact_33
Class: Potential debris
Easting: 260620.345
Northing: 5535831.848
Latitude: 49.926847086 N
Longitude: 6.335425618 W
Height: 0.81 m
Width: 0.36 m
Length: 1.15 m
Depth: 18.88 m
Shadow length: 1.39 m
Image: AB22-1_CH[1_2]
Not measurable height: No
Report use: Yes
Range: 28.26 m
Altitude: 18.88 m

Heading: 55.28 °
Date-time: 21/04/2024 14:59:51.615



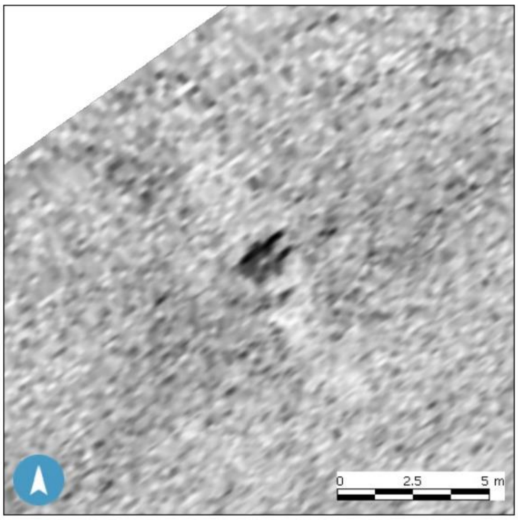
Name: Contact_34
Class: Linear and angular feature potential debris
Easting: 261274.371
Northing: 5536283.439
Latitude: 49.931163459 N
Longitude: 6.326608323 W
Height: 0.57 m
Width: 1.34 m
Length: 3.92 m
Depth: 17.70 m
Shadow length: 0.78 m
Image: AB22-1_CH[1_2]
Not measurable height: No
Report use: Yes
Range: 14.84 m
Altitude: 17.70 m

Heading: 57.25 °
Date-time: 21/04/2024 15:05:18.857



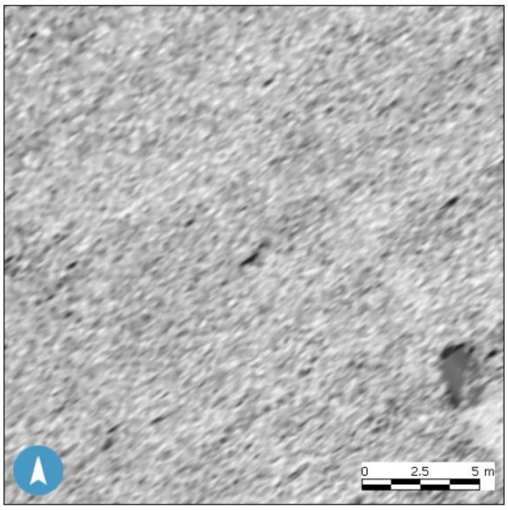
Name:	Contact_35
Class:	Likely geological
Easting:	261300.633
Northing:	5536335.300
Latitude:	49.931639610 N
Longitude:	6.326275108 W
Height:	1.59 m
Width:	1.18 m
Length:	2.50 m
Depth:	14.38 m
Shadow length:	4.32 m
Image:	AB25_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	32.08 m
Altitude:	14.38 m

Heading: 233.97 °
Date-time: 21/04/2024 17:17:46.500



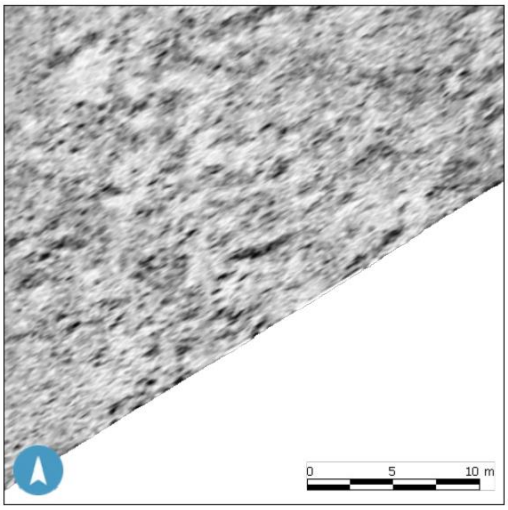
Name:	Contact_36
Class:	Likely geological
Easting:	261271.878
Northing:	5536337.405
Latitude:	49.931647022 N
Longitude:	6.326676400 W
Height:	0.60 m
Width:	1.05 m
Length:	1.75 m
Depth:	14.30 m
Shadow length:	0.82 m
Image:	AB25_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	12.68 m
Altitude:	14.30 m

Heading: 234.35 °
Date-time: 21/04/2024 17:17:55.307



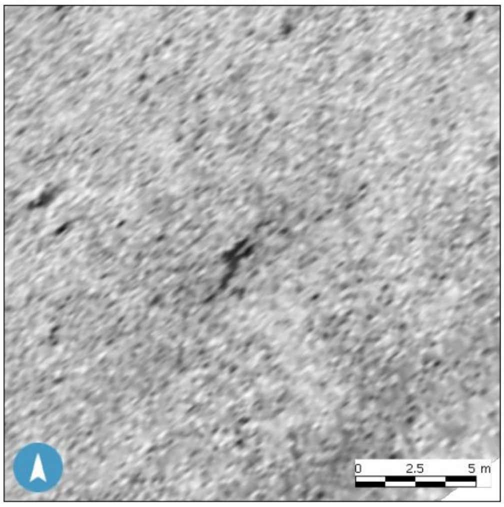
Heading: 234.03 °
Date-time: 21/04/2024 17:17:48.285

Name:	Contact_37
Class:	Likely geological
Easting:	261291.898
Northing:	5536339.955
Latitude:	49.931677913 N
Longitude:	6.326399490 W
Height:	0.30 m
Width:	0.23 m
Length:	0.86 m
Depth:	14.38 m
Shadow length:	0.55 m
Image:	AB25_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	22.77 m
Altitude:	14.38 m



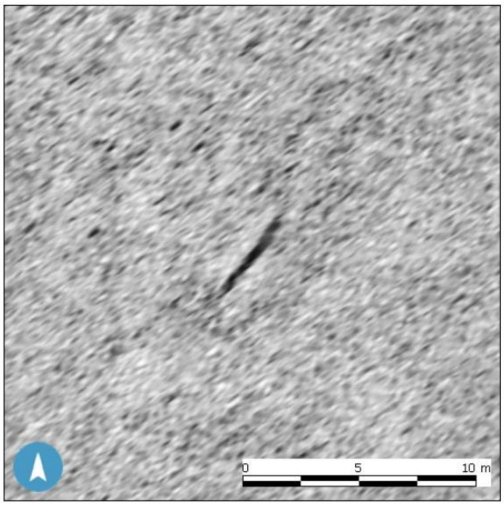
Heading: 237.74 °
Date-time: 21/04/2024 17:27:04.642

Name:	Contact_38
Class:	Linear features
Easting:	260164.134
Northing:	5535505.874
Latitude:	49.923737361 N
Longitude:	6.341568313 W
Height:	0.17 m
Width:	0.72 m
Length:	3.46 m
Depth:	17.81 m
Shadow length:	0.44 m
Image:	AB25_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	45.69 m
Altitude:	17.81 m



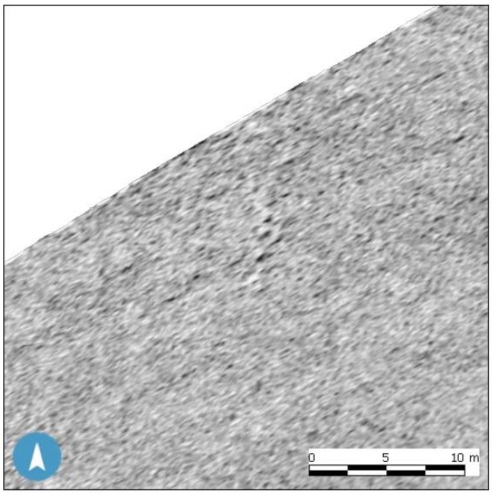
Heading: 233.94 °
Date-time: 21/04/2024 15:12:15.923

Name:	Contact_39
Class:	Likely geological
Easting:	261164.781
Northing:	5536363.543
Latitude:	49.931838931 N
Longitude:	6.328182314 W
Height:	0.00 m
Width:	0.61 m
Length:	3.37 m
Depth:	15.00 m
Shadow length:	0.00 m
Image:	AB27_CH[1_2]
Not measurable height:	Yes
Report use:	Yes
Range:	-18.36 m
Altitude:	15.00 m



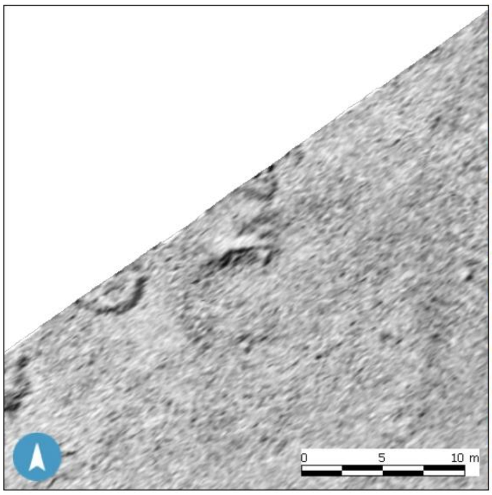
Heading: 236.16 °
Date-time: 21/04/2024 15:13:24.785

Name:	Contact_40
Class:	Linear features
Easting:	261021.277
Northing:	5536275.579
Latitude:	49.930991745 N
Longitude:	6.330123990 W
Height:	0.23 m
Width:	0.39 m
Length:	4.00 m
Depth:	15.23 m
Shadow length:	0.53 m
Image:	AB27_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-32.96 m
Altitude:	15.23 m



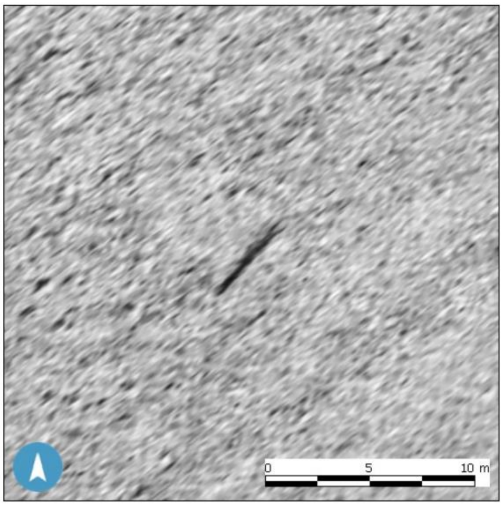
Name:	Contact_41
Class:	Cluster of small featues - boulders?
Easting:	260218.021
Northing:	5535774.358
Latitude:	49.926169658 N
Longitude:	6.340985668 W
Height:	0.17 m
Width:	1.60 m
Length:	3.64 m
Depth:	17.50 m
Shadow length:	0.42 m
Image:	AB29_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	42.26 m
Altitude:	17.50 m

Heading: 59.01 °
Date-time: 21/04/2024 15:26:59.000



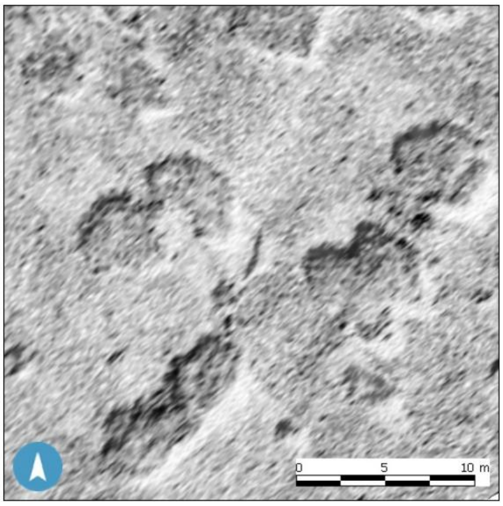
Name:	Contact_42
Class:	Linear and angular feature - potential debris
Easting:	260469.316
Northing:	5535956.364
Latitude:	49.927904608 N
Longitude:	6.337603520 W
Height:	0.15 m
Width:	0.54 m
Length:	2.25 m
Depth:	16.64 m
Shadow length:	0.43 m
Image:	AB29_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	46.57 m
Altitude:	16.64 m

Heading: 54.97 °
Date-time: 21/04/2024 15:28:57.307



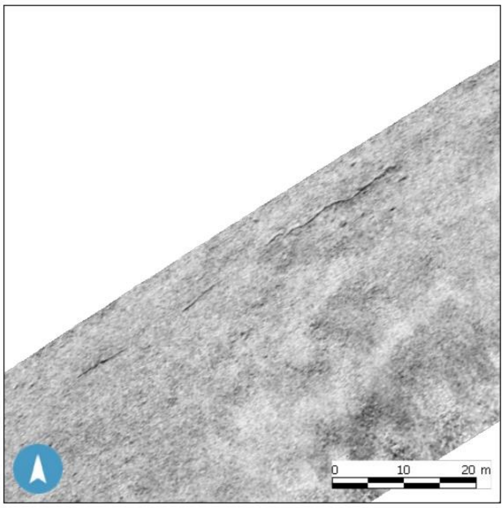
Name:	Contact_43
Class:	Linear features
Easting:	260898.171
Northing:	5536246.151
Latitude:	49.930678278 N
Longitude:	6.331818140 W
Height:	0.10 m
Width:	0.41 m
Length:	3.81 m
Depth:	15.70 m
Shadow length:	0.21 m
Image:	AB29_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	32.27 m
Altitude:	15.70 m

Heading: 52.53 °
Date-time: 21/04/2024 15:32:04.500



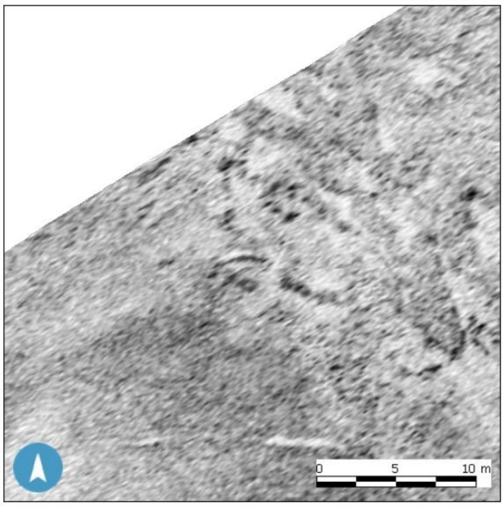
Name:	Contact_44
Class:	Linear feature amongst geology
Easting:	261219.923
Northing:	5536404.583
Latitude:	49.932229457 N
Longitude:	6.327440678 W
Height:	0.24 m
Width:	0.35 m
Length:	2.99 m
Depth:	14.84 m
Shadow length:	0.52 m
Image:	AB29_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-30.02 m
Altitude:	14.84 m

Heading: 51.05 °
Date-time: 21/04/2024 15:34:10.000



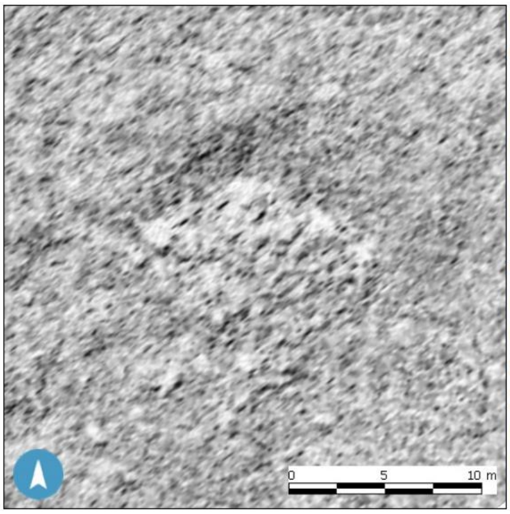
Heading: 237.70 °
Date-time: 21/04/2024 15:45:35.692

Name:	Contact_45
Class:	Chain cable or rope
Easting:	260468.046
Northing:	5536005.953
Latitude:	49.928349354 N
Longitude:	6.337651958 W
Height:	0.17 m
Width:	0.25 m
Length:	53.33 m
Depth:	17.11 m
Shadow length:	0.45 m
Image:	AB30_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-44.81 m
Altitude:	17.11 m



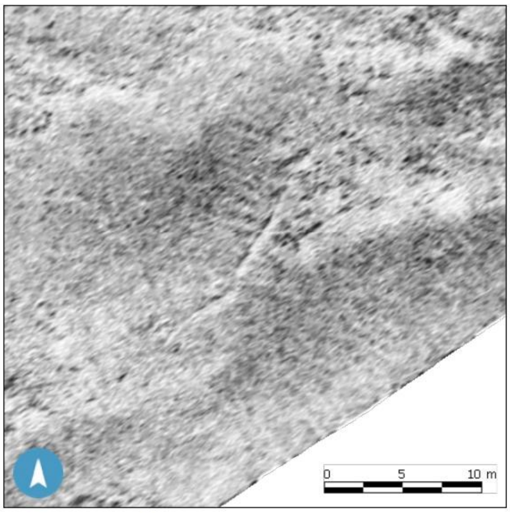
Heading: 239.03 °
Date-time: 21/04/2024 15:45:15.538

Name:	Contact_46
Class:	Curvilinear feature
Easting:	260517.542
Northing:	5536032.478
Latitude:	49.928607347 N
Longitude:	6.336979984 W
Height:	0.11 m
Width:	0.30 m
Length:	3.30 m
Depth:	16.95 m
Shadow length:	0.27 m
Image:	AB30_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-41.19 m
Altitude:	16.95 m



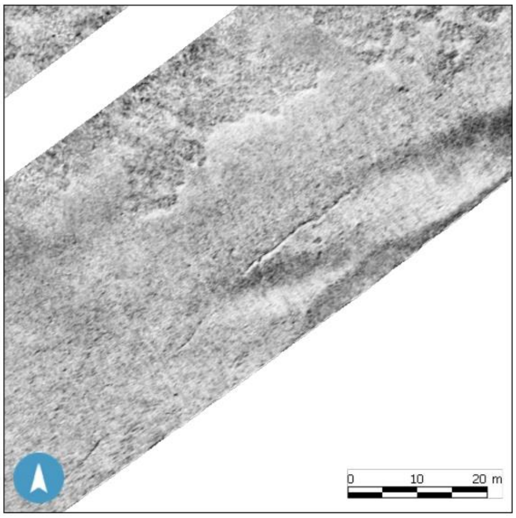
Name:	Contact_47
Class:	LIkely geological but unusual in surrounding seabed
Easting:	261050.176
Northing:	5536438.408
Latitude:	49.932465330 N
Longitude:	6.329822854 W
Height:	0.55 m
Width:	10.03 m
Length:	13.15 m
Depth:	13.83 m
Shadow length:	1.21 m
Image:	AB32_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	23.56 m
Altitude:	13.83 m

Heading: 53.04 °
Date-time: 21/04/2024 17:10:01.571



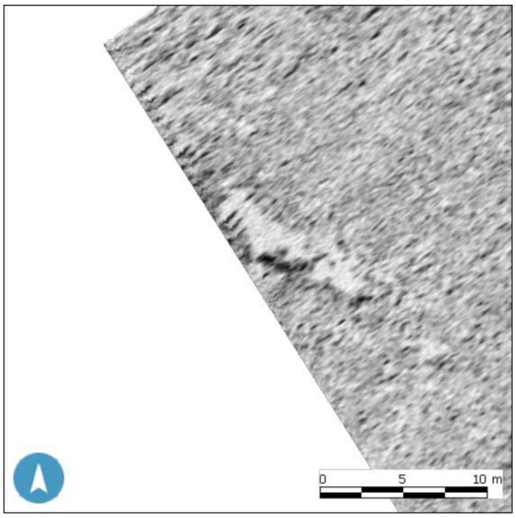
Name:	Contact_48
Class:	Chain cable or rope
Easting:	260715.577
Northing:	5536186.468
Latitude:	49.930069325 N
Longitude:	6.334320969 W
Height:	0.26 m
Width:	0.47 m
Length:	14.77 m
Depth:	14.38 m
Shadow length:	0.70 m
Image:	AB34_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	37.37 m
Altitude:	14.38 m

Heading: 236.42 °
Date-time: 21/04/2024 16:52:58.333



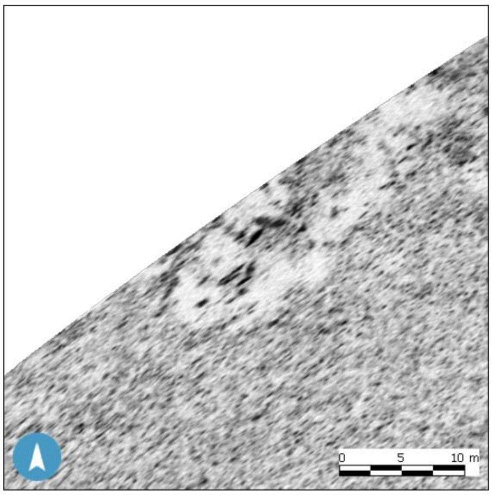
Heading: 233.05 °
Date-time: 21/04/2024 16:55:49.538

Name:	Contact_49
Class:	Chain cable or rope
Easting:	260354.898
Northing:	5535933.124
Latitude:	49.927650079 N
Longitude:	6.339180510 W
Height:	0.18 m
Width:	0.11 m
Length:	62.77 m
Depth:	14.92 m
Shadow length:	0.47 m
Image:	AB34_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	36.68 m
Altitude:	14.92 m



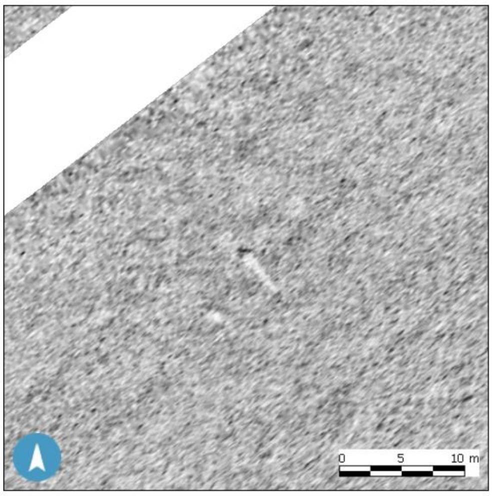
Heading: 237.76 °
Date-time: 21/04/2024 16:58:44.714

Name:	Contact_50
Class:	Potential debris
Easting:	259945.372
Northing:	5535727.034
Latitude:	49.925635317 N
Longitude:	6.344748321 W
Height:	0.49 m
Width:	1.66 m
Length:	9.66 m
Depth:	15.55 m
Shadow length:	1.10 m
Image:	AB34_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-33.45 m
Altitude:	15.55 m



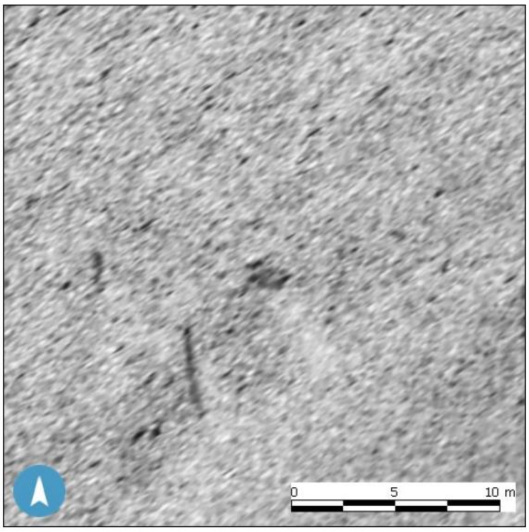
Name:	Contact_51
Class:	Cluster of small featues - boulders?
Easting:	260958.399
Northing:	5536527.512
Latitude:	49.933228699 N
Longitude:	6.331154711 W
Height:	0.17 m
Width:	3.82 m
Length:	11.20 m
Depth:	13.44 m
Shadow length:	0.59 m
Image:	AB36_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	46.57 m
Altitude:	13.44 m

Heading: 54.58 °
Date-time: 21/04/2024 16:42:40.000



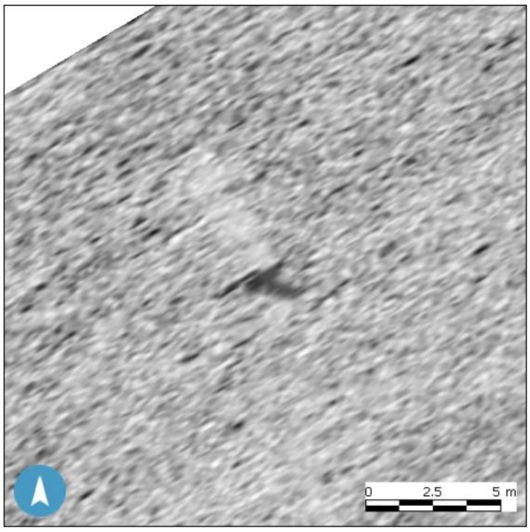
Name:	Contact_52
Class:	Potential debris
Easting:	261800.460
Northing:	5535969.324
Latitude:	49.928552894 N
Longitude:	6.319096457 W
Height:	1.99 m
Width:	1.21 m
Length:	1.01 m
Depth:	12.34 m
Shadow length:	4.10 m
Image:	AB1_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	18.85 m
Altitude:	12.34 m

Heading: 232.66 °
Date-time: 22/04/2024 12:29:15.615



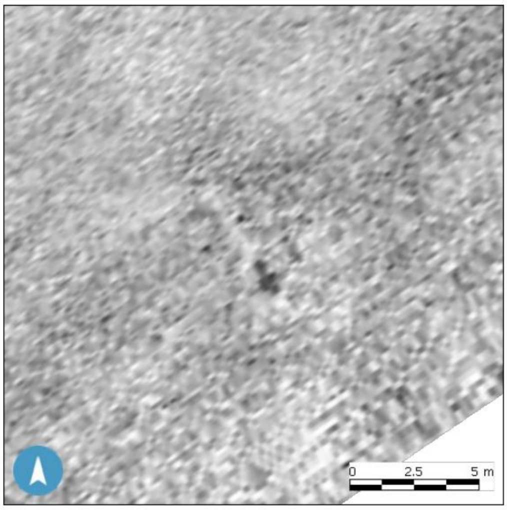
Heading: 236.58 °
Date-time: 22/04/2024 12:35:15.692

Name:	Contact_53
Class:	Potential debris
Easting:	261041.936
Northing:	5535487.979
Latitude:	49.923928175 N
Longitude:	6.329348931 W
Height:	0.11 m
Width:	1.69 m
Length:	3.02 m
Depth:	15.23 m
Shadow length:	0.24 m
Image:	AB1_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-31.10 m
Altitude:	15.23 m



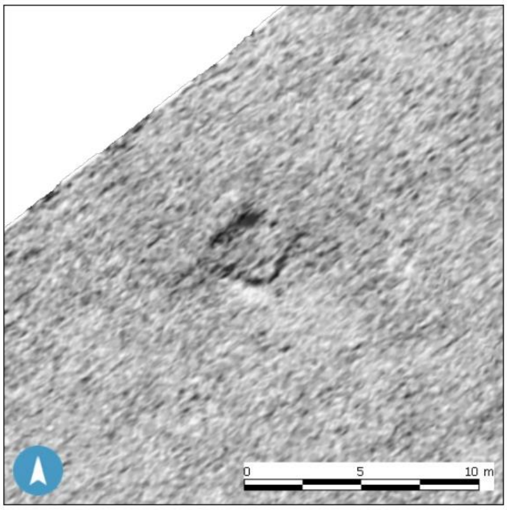
Heading: 238.61 °
Date-time: 22/04/2024 12:36:42.692

Name:	Contact_54
Class:	Potential debris
Easting:	260863.048
Northing:	5535369.017
Latitude:	49.922788488 N
Longitude:	6.331763179 W
Height:	0.03 m
Width:	2.08 m
Length:	2.85 m
Depth:	15.63 m
Shadow length:	0.07 m
Image:	AB1_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-39.32 m
Altitude:	15.63 m



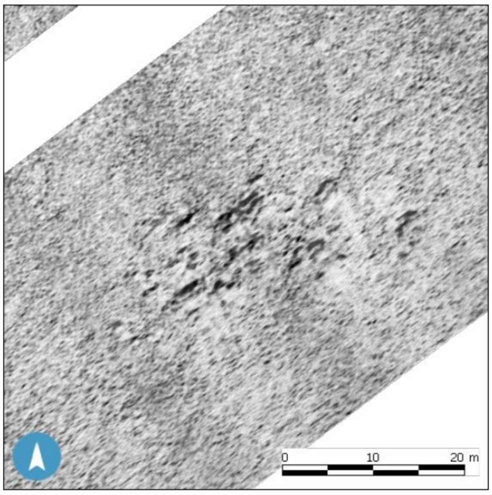
Heading: 235.68 °
Date-time: 22/04/2024 12:39:05.357

Name:	Contact_55
Class:	Potential debris
Easting:	260582.146
Northing:	5535142.931
Latitude:	49.920646068 N
Longitude:	6.335529599 W
Height:	0.56 m
Width:	0.68 m
Length:	1.38 m
Depth:	17.97 m
Shadow length:	0.72 m
Image:	AB1_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-15.33 m
Altitude:	17.97 m



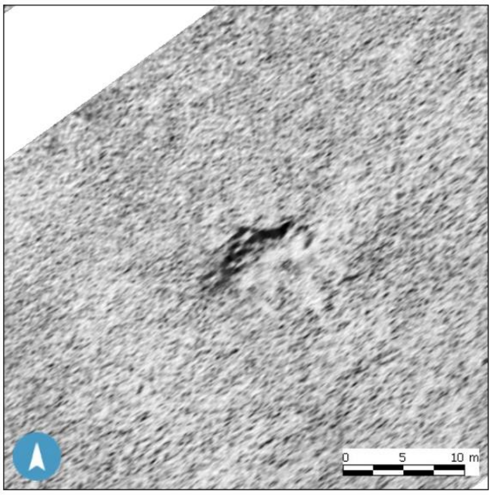
Heading: 52.50 °
Date-time: 22/04/2024 11:24:40.000

Name:	Contact_56
Class:	Angular feature likely geology
Easting:	260594.855
Northing:	5535462.362
Latitude:	49.923519300 N
Longitude:	6.335550962 W
Height:	0.17 m
Width:	2.86 m
Length:	4.67 m
Depth:	15.16 m
Shadow length:	0.49 m
Image:	AB10_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	42.26 m
Altitude:	15.16 m



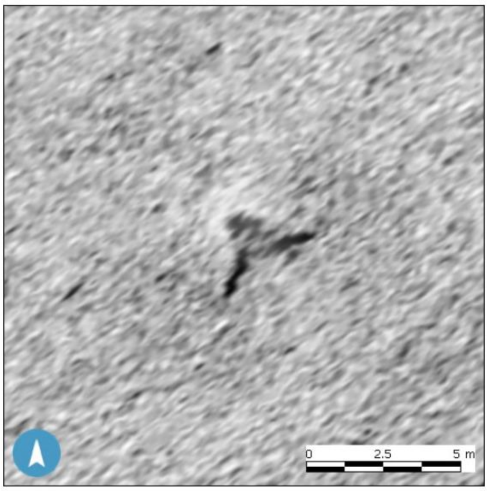
Heading: 53.12 °
Date-time: 22/04/2024 11:33:58.153

Name:	Contact_57
Class:	Likely geological
Easting:	261604.514
Northing:	5536093.934
Latitude:	49.929593657 N
Longitude:	6.321898920 W
Height:	0.37 m
Width:	14.33 m
Length:	30.91 m
Depth:	10.47 m
Shadow length:	1.11 m
Image:	AB10_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-27.96 m
Altitude:	10.47 m



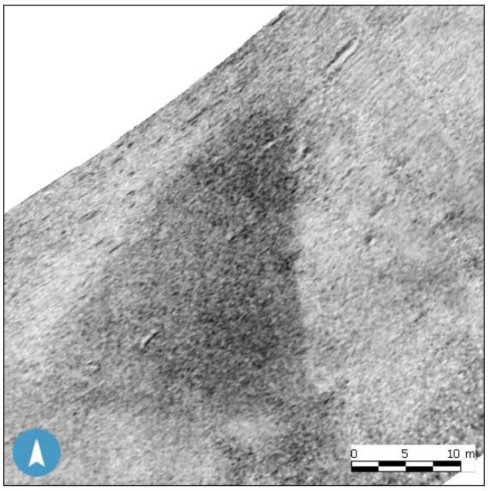
Heading: 53.93 °
Date-time: 22/04/2024 11:33:41.857

Name:	Contact_58
Class:	Likely geological
Easting:	261565.894
Northing:	5536071.385
Latitude:	49.929375789 N
Longitude:	6.322422176 W
Height:	0.43 m
Width:	2.21 m
Length:	9.48 m
Depth:	10.47 m
Shadow length:	1.10 m
Image:	AB10_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-22.67 m
Altitude:	10.47 m



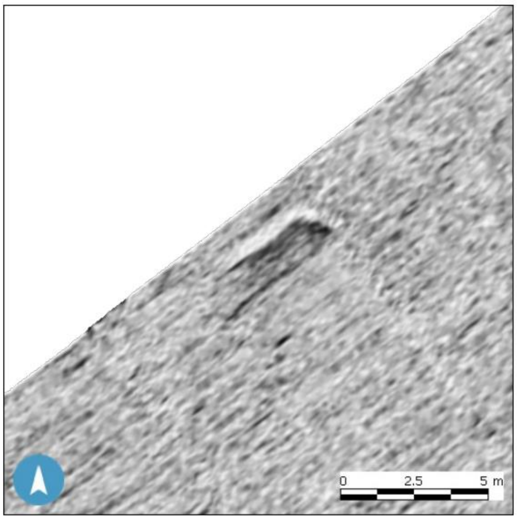
Heading: 55.70 °
Date-time: 22/04/2024 13:44:59.846

Name:	Contact_59
Class:	Potential debris
Easting:	260777.055
Northing:	5535530.280
Latitude:	49.924202064 N
Longitude:	6.333059066 W
Height:	0.34 m
Width:	1.58 m
Length:	3.99 m
Depth:	15.00 m
Shadow length:	0.77 m
Image:	AB11_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-33.15 m
Altitude:	15.00 m



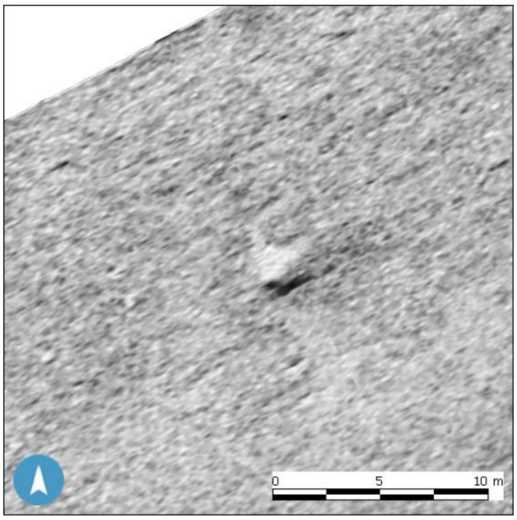
Heading: 234.04 °
Date-time: 22/04/2024 11:45:58.076

Name:	Contact_60
Class:	Area of scattered linear features
Easting:	260390.353
Northing:	5535353.917
Latitude:	49.922463655 N
Longitude:	6.338327793 W
Height:	0.21 m
Width:	12.66 m
Length:	38.53 m
Depth:	17.89 m
Shadow length:	0.41 m
Image:	AB12_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-34.72 m
Altitude:	17.89 m



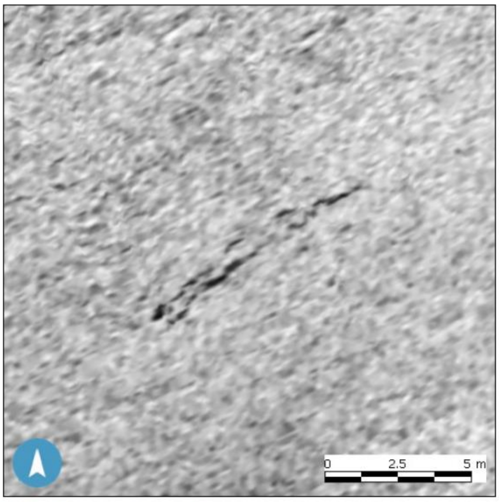
Heading: 232.72 °
Date-time: 22/04/2024 14:04:46.142

Name:	Contact_61
Class:	Likely geological
Easting:	260786.744
Northing:	5535691.612
Latitude:	49.925654525 N
Longitude:	6.333024309 W
Height:	0.19 m
Width:	0.80 m
Length:	3.83 m
Depth:	15.08 m
Shadow length:	0.63 m
Image:	AB13_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-48.24 m
Altitude:	15.08 m



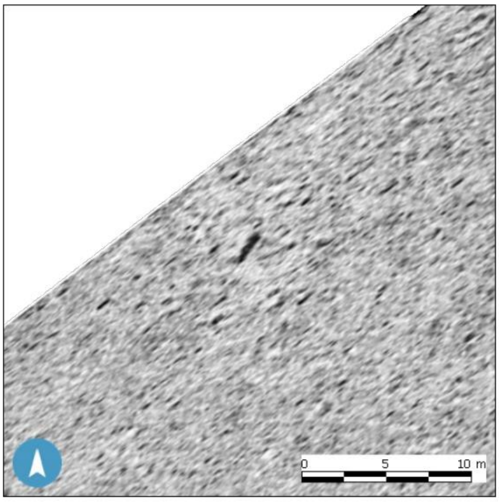
Heading: 241.33 °
Date-time: 22/04/2024 10:46:46.461

Name:	Contact_62
Class:	Likely geological
Easting:	260451.921
Northing:	5535168.558
Latitude:	49.920824010 N
Longitude:	6.337356515 W
Height:	0.64 m
Width:	0.88 m
Length:	2.43 m
Depth:	17.19 m
Shadow length:	1.50 m
Image:	AB4_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-38.25 m
Altitude:	17.19 m



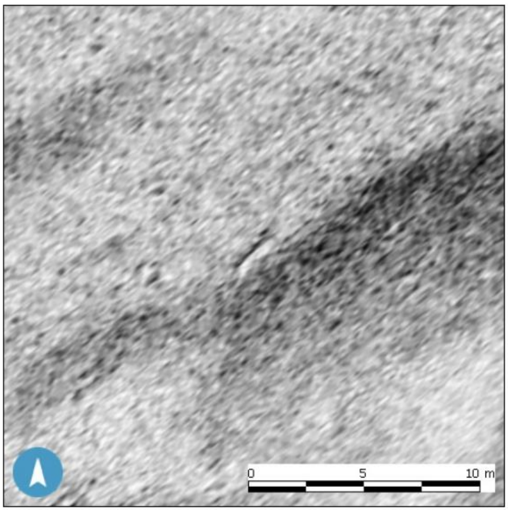
Heading: 64.06 °
Date-time: 22/04/2024 10:49:34.153

Name:	Contact_63
Class:	Linear features
Easting:	260413.075
Northing:	5535194.059
Latitude:	49.921037416 N
Longitude:	6.337912567 W
Height:	0.24 m
Width:	0.66 m
Length:	8.62 m
Depth:	18.13 m
Shadow length:	0.39 m
Image:	AB6_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	25.42 m
Altitude:	18.13 m



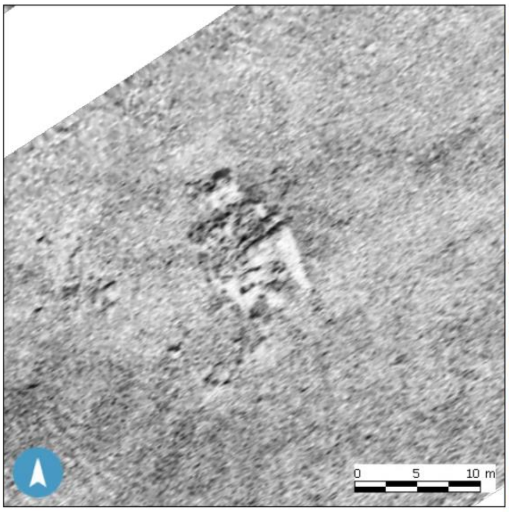
Heading: 52.65 °
Date-time: 22/04/2024 16:19:59.583

Name:	Contact_64
Class:	Potential debris
Easting:	260933.062
Northing:	5536256.440
Latitude:	49.930784617 N
Longitude:	6.331339190 W
Height:	0.13 m
Width:	0.56 m
Length:	2.21 m
Depth:	14.53 m
Shadow length:	0.39 m
Image:	AB28_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	44.42 m
Altitude:	14.53 m



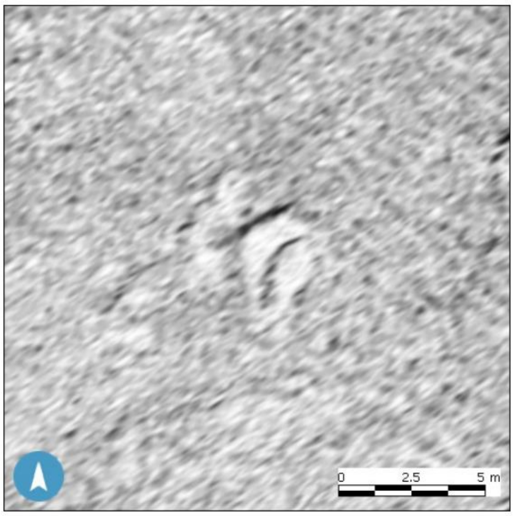
Name:	Contact_65
Class:	Linear features
Easting:	260458.649
Northing:	5535925.552
Latitude:	49.927623679 N
Longitude:	6.337732760 W
Height:	0.24 m
Width:	0.21 m
Length:	2.29 m
Depth:	15.47 m
Shadow length:	0.56 m
Image:	AB31_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	33.74 m
Altitude:	15.47 m

Heading: 231.06 °
Date-time: 22/04/2024 16:36:11.538



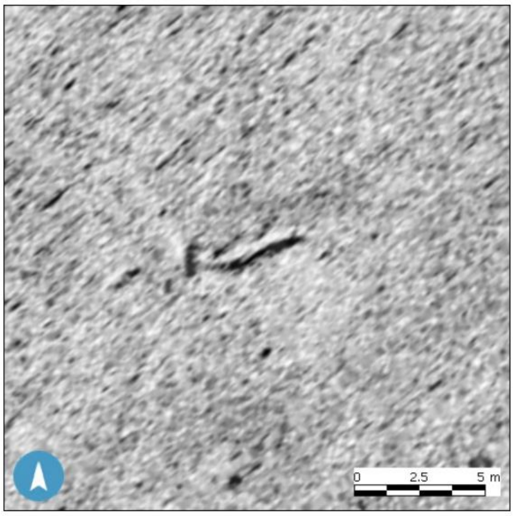
Name:	Contact_66
Class:	Cluster of linear and other features - geological?
Easting:	260215.770
Northing:	5535884.670
Latitude:	49.927159228 N
Longitude:	6.341085512 W
Height:	1.38 m
Width:	6.59 m
Length:	10.26 m
Depth:	15.55 m
Shadow length:	2.48 m
Image:	AB35_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	22.95 m
Altitude:	15.55 m

Heading: 236.55 °
Date-time: 22/04/2024 17:14:41.384



Name:	Contact_67
Class:	Potential debris
Easting:	261836.599
Northing:	5535955.768
Latitude:	49.928445575 N
Longitude:	6.318585423 W
Height:	0.59 m
Width:	1.34 m
Length:	2.82 m
Depth:	10.94 m
Shadow length:	1.27 m
Image:	AB0_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	19.74 m
Altitude:	10.94 m

Heading: 236.40 °
Date-time: 22/04/2024 10:06:53.384



Name:	Contact_68
Class:	Linear features
Easting:	261172.959
Northing:	5536188.618
Latitude:	49.930271551 N
Longitude:	6.327960275 W
Height:	0.35 m
Width:	0.52 m
Length:	4.52 m
Depth:	12.66 m
Shadow length:	0.74 m
Image:	AB21_CH[1_2]
Not measurable height:	No
Report use:	Yes
Range:	-23.95 m
Altitude:	12.66 m

Heading: 231.56 °
Date-time: 22/04/2024 14:58:50.461

Appendix IV – Magnetometer Targets (CISMAS)

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
AB0_1	7	386	77	192	+ spike	0.3	8.5	8.2	48351.58	261727.6	5536318.69		
AB0_2	4	221	44	450	+ spike	0.4	8.6	8.2	48350.65	261796.9	5536167.54		
AB0_3	6	843	169	2886	dipole	0.8	12	11.2	48345.33	261110.3	5535466.85		
AB0_4	3	690	138	3344	+ spike	0.8	14	13.2	48345.44	260855.3	5535286.8		
AB1_1	3	378	76	1409	- spike	0.7	11.5	10.8	48314.08	261241.8	5535593.22		
AB1_2	5	930	186	2687	+ spike	0.7	13	12.3	48318.97	260595.3	5535130.7	MJ_55 (18m)	
AB1_3	4	1297	259	2159	- spike with shoulders	0.7	15.5	14.8	48310.85	260864	5535322.84		
AB2_1	6	695	139	1125	+ spike with single shoulder	1.5	12	10.5	48347	260831.7	5535343.32		
AB2_2	4	246	49	1267	+ spike	1.5	10	8.5	48344.61	260881.3	5535378.57	MJ_54 (20m)	
AB2_3	6	307	61	1720	- spike with single shoulder	1.5	9.5	8	48338.24	261039.6	5535487.36	MJ_53 (2m)	
AB3_1	9	1675	335	860	single + spike	1.2	13.5	12.3	48321.77	260816.8	5535364.95		
AB3_2	8	1008	202	1249	ragged + spike	1.2	12	10.8	48317.86	260980.8	5535478.4		
AB3_3	8	509	102	2351	asymmetrical + spike	1.4	10	8.6	48321.16	261445.9	5535811.38		
AB4_1	5	389	78	958	- spike with shoulder	0.8	10	9.2	48336.3	261272.7	5535705.01		
AB4_2	8	953	191	1546	+ spike	0.9	11.5	10.6	48347.65	260969.3	5535490.38		
AB4_3	4	577	115	1856	- spike	0.7	12	11.3	48336.42	260809.6	5535374.76		
AB4_4	4	962	192	2324	+ spike	1.1	14.5	13.4	48341.3	260569.3	5535201.31		
AB5_1	14	954	191	591	- spike	0.7	9.5	8.8	48302.56	261601.6	5535971.91		
AB5_2	9	1072	214	873	+ spike	0.4	11	10.6	48320.44	261463.4	5535871.56		

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
AB5_3	8	1154	231	1362	messy dipole	0.7	12	11.3	48310.93	261205.6	5535692.71		
AB5_4	8	1489	298	1825	+ spike	0.7	13	12.3	48316.7	260962.9	5535513.99		
AB5_5	5	1150	230	2008	dipole	0.8	14	13.2	48310.47	260868.8	5535447.95		
AB6_1	7	2004	401	88	+ spike	0.8	15	14.2	48345.64	260413.6	5535169.63	MJ_63 (24m)	
AB6_2	5	843	169	1094	messy dipole	1.1	13	11.9	48339.07	260834.2	5535464.17		
AB6_3	9	927	185	1365	+ spike	0.9	11	10.1	48347.34	260942.2	5535541.69		
AB6_4	9	634	127	1421	+ spike	1.1	10	8.9	48347.6	260966.3	5535556.47		
AB6_5	5	256	51	1917	+ spike	1	9	8	48344.11	261172.1	5535702.65		
AB6_6	7	230	46	2057	+ spike	1.1	8	6.9	48344.97	261229.2	5535746.48		
AB6_7	5	137	27	2348	dipole	1	7.5	6.5	48339.43	261351.4	5535833.84		
AB7_1	8	2148	430	717	dipole	1.1	15	13.9	48311.91	260726.6	5535417.48		
AB7_2	23	4937	987	889	+ spike	1.1	14	12.9	48332.81	260808.9	5535472.63		25m from negative spike AB8_5 - worth investigating
AB7_3	5	648	130	1689	+ spike	1.1	12	10.9	48314.22	261173.5	5535733.87		
AB7_4	5	352	70	2040	dipole	1.1	10	8.9	48309.18	261333.4	5535845.71		
AB7_5	4	221	44	2796	-spike	0.8	9	8.2	48305.96	261707.1	5536111.2		
AB7_6	5	228	46	2971	-spike	0.8	8.5	7.7	48309.15	261806.8	5536176.04		
AB8_1	5	318	64	452	+ spike	0.4	9	8.6	48339.69	261505.9	5535996.21		
AB8_2	10	779	156	574	+ spike with single shoulder	0.3	9.5	9.2	48347.55	261429.9	5535938.04		
AB8_3	5	456	91	729	+ spike with single shoulder	0.3	10	9.7	48343.44	261332.8	5535870.1		
AB8_4	5	546	109	856	- spike	0.7	11	10.3	48336.18	261259.5	5535818.63		
AB8_5	20	2886	577	1672	- spike	0.7	12	11.3	48316.55	260799.2	5535495.96		di
AB9_1	7	510	102	800	+ spike	1	10	9	48316.21	261450.5	5535981.45		
AB9_2	5	365	73	888	+ spike	1	10	9	48313.98	261411.2	5535956.86		

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
AB9_3	10	1000	200	1133	+ spike	1	11	10	48319.51	261306.1	5535878.42		
AB9_4	5	741	148	1964	+ spike	1.1	12.5	11.4	48314.26	260948.7	5535630.92		
AB9_5	8	2148	430	2629	dipole	1.1	15	13.9	48309.21	260693.5	5535443.47		
AB10_1	9	1198	240	1371	+ spike	1	12	11	48341.69	260884.4	5535627.47		
AB10_2	7	493	99	2306	dipole	1.1	10	8.9	48334.68	261272.9	5535902.25		
AB10_3	6	483	97	2563	+ spike	0.7	10	9.3	48337.63	261388.1	5535977.86		
AB10_4	5	286	57	2704	+ spike	0.7	9	8.3	48337.05	261459.2	5536032.49		
AB10_5	6	263	53	2910	+ spike	0.4	8	7.6	48339.61	261574.7	5536109.77		
AB10_6	5	144	29	3080	+ spike with single shoulder	0.4	7	6.6	48338.81	261670.6	5536174.6		
AB11_1	7	810	162	1954	+ spike	1.5	12	10.5	48316.98	261249.5	5535911.29		
AB11_2	20	2122	424	2065	dipole	1.3	11.5	10.2	48316.25	261301.6	5535947.7		
AB11_3	5	456	91	2301	+ spike	1.3	11	9.7	48317.21	261411.4	5536026.66		
AB11_4	5	307	61	2366	+ spike with single shoulder	1.5	10	8.5	48317.66	261441.8	5536048.62		
AB11_5	5	318	64	2418	+ spike	1.4	10	8.6	48316.98	261467.5	5536064.97		
AB11_6	5	296	59	2722	+ spike	1.1	9.5	8.4	48318	261621.1	5536179.31		
AB11_7	8	394	79	2758	+ spike	1.1	9	7.9	48319.56	261639.7	5536194.94		
AB12_1	8	230	46	139	dipole	0.4	7	6.6	48335.62	261663.6	5536220.11		
AB12_2	5	211	42	511	+ spike	0.5	8	7.5	48336.55	261431.3	5536064.55		
AB12_3	9	395	79	551	+ spike	0.4	8	7.6	48339.79	261406.6	5536047.2		
AB12_4	5	219	44	687	+ spike	0.4	8	7.6	48336.61	261322.5	5535988.77		
AB12_5	8	686	137	1282	+ spike	0.5	10	9.5	48339.25	260959.7	5535723.63		
AB12_6	11	1237	247	1547	dipole	0.6	11	10.4	48328.44	260791.6	5535610.68		
AB12_7	7	1010	202	1827	+ spike ragged	0.7	12	11.3	48336.07	260615.8	5535490.44		
AB12_8	5	1462	292	2305	+ spike	0.7	15	14.3	48331.63	260372.3	5535300.58		

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
AB13_1	11	775	155	841	+ spike asymmetrical	1.1	10	8.9	48322.25	261396.1	5536066.8		
AB13_2	6	756	151	1335	+ spike ragged	1.2	12	10.8	48315.69	261191.4	5535917.32		
AB13_3	5	1343	269	2129	+ spike with single shoulder	1.1	15	13.9	48319.89	260869.9	5535693.32		
AB14_1	14	1442	288	1358	+ spike ragged	0.9	11	10.1	48339.16	260875.4	5535734.85		
AB14_2	6	423	85	2429	dipole asymmetrical	0.6	9.5	8.9	48327.3	261389.5	5536096.95		
AB15_1	5	1230	246	1119	+ spike	1.5	15	13.5	48320.13	260843.1	5535745.68		
AB15_2	4	608	122	1223	dipole	1.5	13	11.5	48314.44	260896.2	5535781.34		
AB15_3	5	579	116	1750	- spike	1.5	12	10.5	48310.76	261154.7	5535972.07		
AB16_1	8	457	91	426	+ spike	0.7	9	8.3	48331.41	260963	5535846.56		
AB16_2	5	402	80	606	- spike slow	0.7	10	9.3	48320.84	260863.2	5535782.48		
AB16_3	5	546	109	855	+ spike	0.7	11	10.3	48326.28	260729.7	5535689.09		
AB16_4	9	1299	260	1247	- spike	0.7	12	11.3	48313.79	260525.5	5535543.2		
AB17_1	8	1185	237	1884	+ spike with single shoulder	1.1	12.5	11.4	48323.8	260942.8	5535872.76		
AB18_1	6	866	173	667	+ spike	0.7	12	11.3	48326.81	260522.5	5535610.5	MJ_12 (32m)	Possible gun?
AB18_2	4	437	87	1194	dipole	0.7	11	10.3	48320.78	260802.3	5535814.06		
AB18_3	6	483	97	1418	+ spike	0.7	10	9.3	48327.32	260934.8	5535893.03		
AB19_1	6	1611	322	698	+ spike	1.1	15	13.9	48323.67	260525.6	5535636.3		
AB19_2	7	1150	230	1473	+ spike	1.2	13	11.8	48327.07	260925.5	5535930.77		
AB19_3	4	518	104	2179	+ spike	1.1	12	10.9	48326.16	261307.7	5536193.45	MJ_31 (21m)	
AB19_4	4	354	71	2470	+ spike	1.4	11	9.6	48327.82	261631.6	5536412.57		
AB20_1	3	399	80	938	+ spike	2	13	11	48361.03	260525.4	5535678.57		

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
AB20_2	5	485	97	1904	dipole asymmetrical	2.1	12	9.9	48357	260931.2	5535959.54	MJ_14 (28m)	
AB21_1	5	256	51	528	dipole	2	10	8	48326.15	261385.8	5536301.81	MJ_32 (2.5m)	
AB21_2	5	442	88	1607	+ Spike	2.4	12	9.6	48330.66	260982.7	5536028.31		
AB21_3	5	442	88	1809	+ Spike	2.4	12	9.6	48330.33	260908	5535972.21		
								0					
AB22/1_1	10	804	161	191	dipole asymmetrical	0.7	10	9.3	48329.09	260270	5535548.92		
AB22/1_2	7	659	132	630	dipole Sym	2.2	12	9.8	48338.67	260479.9	5535701.23		See AB22/2_3
AB22/1_3	7	907	181	1379	-ve spike	2.1	13	10.9	48336.81	260852.5	5535962.97		
AB22/1_4	6	889	178	2252	+ spike single shoulder	2.1	13.5	11.4	48345.84	261284.8	5536270.11		See AB22/2_1
AB22/2_1	6	395	79	883	-ve spike single shoulder	2.3	11	8.7	48339.28	261289	5536267.19		Close to AB22/1_4 and AB23_1
AB22/2_2	6	821	164	1987	-ve spike	2.4	13.5	11.1	48331.5	260855.4	5535960.86		less than 3M from AB22/1_2. V close to CM0052 (DFS Anchor)
AB22/2_3	5	780	156	2913	dipole symmetrical	2.4	14	11.6	48334.92	260481.8	5535699.15		
AB23_1	8	509	102	1973	-ve spike	2.4	11	8.6	48323.73	261266	5536289.89	MJ_34 (11m)	See AB22/2_2
AB23_2	14	744	149	2271	+ve spike, asymmetrical	2.4	10.5	8.1	48345	261410.1	5536389.31		
AB24_1	7	721	144	1338	+ve spike	2.4	12.5	10.1	48342.71	260722.3	5535939.01		
AB24_2	7	445	89	2089	- spike	2.4	11	8.6	48335.4	261080.9	5536191.93		
AB24_3	6	233	47	2521	dipole asymmetrical	2.2	9.5	7.3	48343.17	261295.3	5536341.22	MJ_37 (3.5m) - MJ_35 (8m)	
AB24_4	4	118	-spike		-spike	2.2	9	6.8	48331.69	260166.3	5535542.41		5m from **G9**
AB25_1	8	800	160	1803	+ve spike	2	12	10	48364.29	260600.8	5535879.29		
AB25_2	8	1382	276	2533	dipole ragged	2	14	12	48356.69	260219.5	5535594.79		
AB25_3	8	2586	517		+spike	1.9	14	12.1	48352.41	260192.8	5535572.64	MJ_11 (7m)	2m from **G7**, MJ_11 is 5.5m from **G7**

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
AB26_1	5	144	29	59	dipole	2.4	9	6.6	48341.25	260784.2	5536035.8		
AB26_2	53	8708	1742	3218	dipole	2.2	14	11.8	48341.85	260459.5	5535806.1		375mNE of stern. Big, clean target *2-8 tonnes
AB27_1	7	907	181	1782	dipole	1.6	12.5	10.9	48339.43	260606	5535938.1		
AB27_2	10	1907	381	2654	dipole	1.6	14	12.4	48331.39	260135	5535600.83		
AB28_1	6	452	90	2095	-ve spike	2.4	11.5	9.1	48339.64	260987.6	5536248.16		
AB29_1	4	593	119	647	dipole	1.6	13	11.4	48342.56	260436.5	5535882.65		
AB29_2	6	531	106	1094	+ve spike ragged	1.4	11	9.6	48345.79	260694.6	5536061.91		
AB29_3	5	429	86	1293	+ve spike ragged	1.5	11	9.5	48346.37	260813.9	5536144.29		
AB29_4	9	444	89	1821	dipole	1.6	9.5	7.9	48346.51	261131.3	5536368.44		
AB30_1	15	1545	309	1568	dipole	1.4	11.5	10.1	48341.12	260467.3	5535953.34	MJ_42 (3.5m)	12m from AB31_2. about 1.5 tonnes
AB31_1	28	2041	408	697	+ve spike	2	11	9	48374.67	261193.4	5536482.87		
AB31_2	5	442	88	2258	- spike	2.4	12	9.6	48344.37	260465.3	5535964.95		See AB30_1
AB31_3	4	354	71	2345	+ve spike	2.4	12	9.6	48350.83	260425.4	5535934.74		
AB32_1	3	328	66	2173	-ve spike	2.2	12.5	10.3	48357.11	260968.8	5536355.26		
AB32_2	5	702	140	2876	+ve spike	2.3	13.5	11.2	48365.14	261271.7	5536569.24		
AB32_3	4	641	128	2948	dipole	2.3	14	11.7	48360.53	261301.2	5536591.19		
AB33_1	7	600	120	1604	+ve spike	1.5	11	9.5	48358.76	260770.8	5536241.88		
AB33_2	5	256	51	2112	-ve spike	2	10	8	48347.65	261047.5	5536438.88		Close to AB34_2

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
AB33_3	10	422	84	2399	dipole	2	9.5	7.5	48355.21	261175.3	5536536.24		
AB34_1	7	1503	301	526	- spike	1.6	14.5	12.9	48356.26	261145	5536534.65		
AB34_2	6	498	100	793	+ spike	1.6	11	9.4	48358.72	261036.3	5536457.12		see AB33_2
AB34_2	5	546	109	2629	+ spike truncated?	1.7	12	10.3	48354.79	260081.7	5535771.76		
AB35_1	4	137	27	636	+ve spike ragged	2	9	7	48359.4	261131.4	5536559.86		
AB35_2	5	219	44	849	dipole asymmetrical	1.9	9.5	7.6	48354.36	261022.7	5536479.07		
AB35_3	8	474	95	1009	+ve spike	1.6	10	8.4	48363.27	260939.1	5536418.75		Close to AB36_3
AB35_4	7	415	83	2678	+ve spike ragged	1.6	10	8.4	48361.74	260038.1	5535774.5		
AB35_5	42	3062	612	2825	+ve spike	2	11	9	48398.64	259956.9	5535715.85	MJ_50 (16m)	
AB36_1	4	322	64	1816	- spike ragged	1.7	11	9.3	48347.17	260803.3	5536356.61		
AB36_2	3	211	42	1957	+spike ragged	1.6	10.5	8.9	48352.18	260862.3	5536396.29		
AB36_3	4.5	267	53	2098	-spike	1.6	10	8.4	48346.07	260922	5536445.8		See AB35_3
AB36_4	4	162	32	2520	+spike ragged	1.6	9	7.4	48355.41	261133.2	5536593.24		
AB37_1	5	256	51	2126	+spike ?dip	1.5	9.5	8	48363.82	260971.5	5536509.47		See AB38_1
AB37_2	5	256	51	2185	-spike ?dip	1.5	9.5	8	48356.03	261001.9	5536531.15		
AB38_1	105	6223	1245	687	dipole	1.6	10	8.4	48371.62	260962.4	5536526.66	MJ_51 (4m)	Close to AB37_1. Large dipole 1 to 6 tonnes
AB38_2	9	748	150	1501	+spike	1.6	11	9.4	48356.49	260571.8	5536251.79		
C2_1	4	50	10	447	+spike	0	5	5	48372.23	261963	5537198.42		Probably a power cable
C2_2	40	562	112	498	+spike	-0.2	5	5.2	48401.3	261985.9	5537212.71		Probably a power cable
C2_3	430	6771	1354	809	-spike with shoulders	-0.4	5	5.4	47972.98	262114.4	5537304.54		Probably a power cable

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
C2_4	170	1655	331	2027	-spike 'C2	-0.1	4.5	4.6	48316.9	262594.2	5537648.91		Probably a power cable
C3_1	40	1150	230	22	-spike	0.4	7	6.6	48324.98	262621.6	5537638.08		Probably a power cable
C3_2	85	2792	558	882	-spike shoulders	0.1	7	6.9	48280.48	262170.6	5537295.5		Probably a power cable
C3_3	25	687	137	1146	dip asymmetrical	0	6.5	6.5	48375.53	262031.7	5537194.37		Probably a power cable
C3_4	30	616	123	1225	+spike	0.1	6	5.9	48389.03	261990.7	5537160.99		Probably a power cable
C3_5	35	756	151	1571	+spike	0	6	6	48391.71	261810.6	5537039		215m from the nearest detected power cable
								0					
C4_1	150	2109	422	130	dip asymmetrical	-0.2	5	5.2	48382.47	262697	5537627.83		Probably a power cable
C4_2	220	4752	950	967	+spike	0	6	6	48591.57	262221.1	5537280.8		Probably a power cable
C4_3	40	1258	252	1206	+spike	-0.3	6.5	6.8	48405.66	262082.2	5537182.46		Probably a power cable
C4_4	25	687	137	1294	+spike single shoulder	0	6.5	6.5	48391.93	262033.4	5537143.02		Probably a power cable
		0	0					0					
C5_1	30	786	157	505	+spike with shoulder	-0.4	6	6.4	48391.39	262065.3	5537124.95		Probably a power cable
C5_2	40	1049	210	669	-spike	-0.4	6	6.4	48322.63	262132.6	5537172.6		Probably a power cable
C5_3	250	6251	1250	998	+spike	-0.3	6	6.3	48594.96	262272.3	5537264.63		Probably a power cable
C5_4	20	524	105	2113	dip asymmetrical	-0.4	6	6.4	48375.68	262760.4	5537615.25		Probably a power cable
C6_1	6	71	14	733	dip	0.1	5	4.9	48366.91	262395.4	5537305.61		90m from the nearest detected power cable
C6_2	15	199	40	824	+spike	-0.1	5	5.1	48378.85	262345.8	5537268.66		36m from the nearest detected power cable
C6_3	140	1857	371	879	dip	-0.1	5	5.1	48364.17	262315.2	5537247.1		Probably a power cable
C6_4	25	332	66	914	dip	-0.1	5	5.1	48358.73	262295.9	5537234.08		Probably a power cable
C6_5	20	265	53	1122	+spike	-0.1	5	5.1	48384.25	262180	5537150.72		Probably a power cable
C6_6	70	984	197	1157	+spike with shoulders	-0.2	5	5.2	48434.04	262160.3	5537137.3		Probably a power cable
C6_7	65	862	172	1223	+spike	-0.1	5	5.1	48428.05	262123.3	5537112.8		Probably a power cable

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
C6_8	120	1500	300	1273	+spike	0	5	5	48492.96	262095.7	5537093.24		Probably a power cable
								0					
C7_1	90	2250	450	134	+spike	-0.3	6	6.3	48456.44	262123.7	5537070.49		Probably a power cable
C7_2	18	409	82	225	+spike	-0.1	6	6.1	48366.49	262157.1	5537097.8		Probably a power cable
C7_3	40	953	191	327	+spike	-0.2	6	6.2	48404.08	262197	5537122.61		Probably a power cable
C7_4	20	477	95	392	+spike	-0.2	6	6.2	48380.39	262221.3	5537139.62		Probably a power cable
C7_5	380	9961	1992	765	+spike	-0.4	6	6.4	47979.55	262356.1	5537232.55		Probably a power cable
C8_1	10	157	31	755	-spike	-0.4	5	5.4	48350.14	262394.4	5537202.46		Probably a power cable
C8_2	7	104	21	947	-spike	-0.3	5	5.3	48352.61	262278.9	5537122		Probably a power cable
C8_3	7	110	22	958	-spike	-0.4	5	5.4	48352.83	262272.7	5537116.58		Probably a power cable
C8_4	22	309	62	1002	-spike	-0.2	5	5.2	48339.31	262246.3	5537097.97		Probably a power cable
C8_5	21	279	56	1051	-spike	-0.1	5	5.1	48338.32	262216	5537079.3		Probably a power cable
C8_6	150	2233	447	1093	+spike	-0.3	5	5.3	48526.66	262191	5537061.83		Probably a power cable
C8_7	180	2680	536	1157	-spike	-0.3	5	5.3	48170.96	262151.7	5537037.61		Probably a power cable
								0					
C9_1	14	460	92	478	+spike	-0.4	6.5	6.9	48373.71	262136.4	5536977.89		56m from the nearest detected power cable
C9_2	150	4928	986	593	-spike	-0.4	6.5	6.9	48204.34	262180.8	5537011.43		Probably a power cable
C9_3	105	3449	690	712	-spike	-0.4	6.5	6.9	48254.13	262227.6	5537043.92		Probably a power cable
C9_4	13	409	82	935	+spike	-0.3	6.5	6.8	48372.16	262315.3	5537105.22		Probably a power cable
C10_1	130	2047	409	815	dipole very asymmetrical	-0.4	5	5.4	48349.3	262495.5	5537179.49		Probably a power cable
C10_2	6	94	19	994	-spike	-0.4	5	5.4	48352.12	262386.4	5537102.84		Probably a power cable
C10_3	15	223	45	1043	-spike	-0.3	5	5.3	48340.36	262356.4	5537082.28		Probably a power cable
C10_4	160	2519	504	1168	dipole very asymmetrical	-0.4	5	5.4	48480.22	262283	5537028.08		Probably a power cable
C10_5	140	2204	441	1283	-spike	-0.4	5	5.4	48218.67	262218.7	5536973.24		Probably a power cable

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
C11_1	130	5057	1011	177	+spike with shoulder	-0.3	7	7.3	48484.14	262244.6	5536958.14		Probably a power cable
C11_2	130	5268	1054	390	-spike	-0.4	7	7.4	48229.26	262331.6	5537018.73		Probably a power cable
C11_3	50	1250	250	547	+spike	-0.3	6	6.3	48410.52	262398.1	5537060.01		Probably a power cable
C11_4	300	7864	1573	896	+spike with shoulder	-0.4	6	6.4	48640.9	262540	5537165.14		Probably a power cable
C12_1	60	998	200	604	+spike	-0.5	5	5.5	48408.08	262591.4	5537149.94		Probably a power cable
C12_2	40	666	133	611	+spike	-0.5	5	5.5	48389.31	262586.9	5537146.81		Probably a power cable
C12_3	25	513	103	846	dipole symmetrical	-0.4	5.5	5.9	48333.17	262430.5	5537036.83		Probably a power cable
C12_4	45	924	185	923	dipole symmetrical	-0.4	5.5	5.9	48337.97	262380.7	5536998.75		Probably a power cable
C12_5	250	6866	1373	1063	+spike with shoulder	-0.5	6	6.5	48598.04	262287.4	5536930.5		Probably a power cable
C13_1	200	6860	1372	736	-spike	-0.5	6.5	7	48136.61	262331.5	5536912.43		Probably a power cable
C13_2	100	3430	686	893	-spike	-0.5	6.5	7	48244.98	262398	5536965.22		Probably a power cable
C13_3	65	2135	427	948	dipole	-0.4	6.5	6.9	48334.88	262421.6	5536983.27		Probably a power cable
C13_4	30	986	197	1256	+spike	-0.4	6.5	6.9	48384.44	262559.9	5537077.11		Probably a power cable
C13_5	360	12348	2470	1434	+spike	-0.5	6.5	7	48723.89	262637.3	5537136.42		Probably a power cable
C14_1	240	3779	756	135	dipole	-0.4	5	5.4	48351.29	262615.7	5537067.42		Probably a power cable
C14_2	30	472	94	401	+spike	-0.4	5	5.4	48376.38	262512.1	5536984.73		Probably a power cable
C14_3	50	787	157	463	-spike	-0.4	5	5.4	48300.21	262469.6	5536955.95		Probably a power cable
C14_4	7	110	22	614	dipole	-0.4	5	5.4	48343.11	262364.1	5536892.48		Probably a power cable
D1/1_1	6	821	164	963	+spike	2.4	13.5	11.1	48341.25	260003.8	5535269.01	MJ_5 (10m)	Only 2m from D1/2_1
D1/2_1	9	1479	296	635	+spike	2.2	14	11.8	48342.22	260001.6	5535268.82	MJ_5 (10m)	Possible anchor
D3_1	15	712	142	1272	+spike	2.2	10	7.8	48340.14	260214.2	5535543.19	MJ_7 (4.5m)	9m from **G8**

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
D4_1	8	824	165	230	+spike ragged	1.9	12	10.1	48336.28	260225.2	5535625.27		
D4_2	20	2450	490	416	dipole asymmetrical	2.3	13	10.7	48330.83	260157.8	5535544.15		9m from AB24_4 (decent dipole worth a look)
D5_1	21	1917	383	1238	dipole asymmetrical	2.3	12	9.7	48320.18	260187.3	5535590.23		5m from the spare fe rudder (AKA fe spar)
D5_2	9	593	119	1343	+spike ragged	2.3	11	8.7	48335.07	260230.4	5535624.47		
D6_1	250	25758	5152	351	dipole asymmetrical	1.9	12	10.1	48368.44	260157.8	5535577.98	MJ_17 (6m)	15m south of Colossus stern site
D6_2	16	1852	370	497	dipole asymmetrical	2	12.5	10.5	48322.07	260105.4	5535521.26		
D7_1	4	547	109	571	-spike ragged	1.9	13	11.1	48322.85	259936.2	5535418.95	MJ_18 (12m)	15m from **G10**
D7_2	7	477	95	1069	-spike ragged	2.2	11	8.8	48319.69	260123.5	5535600.25		
D7_3	4	246	49	1217	+spike ragged	2	10.5	8.5	48330.01	260186.6	5535651.65		
D9_1	20	2185	437	495	+spike	1.7	12	10.3	48342.17	259890.7	5535439.84		
D9_2	4	437	87	627	+spike ragged	1.7	12	10.3	48327.62	259950.3	5535493.9		
D10_1	5	144	29	553	+spike ragged	1.4	8	6.6	48328.99	259924.3	5535520.47		
D10_2	10	149	30	679	dip asymmetrical	1.7	7	5.3	48323.04	259869.9	5535455.96		
D11_1	3	241	48	162	dip ragged	1.7	11	9.3	48324.84	259845.5	5535450.44		
D11_2	4	311	62	410	+spike v ragged	1.3	10.5	9.2	48327.46	259962.9	5535567.17		
D11_3	5	318	64	637	+ slow hump	1.4	10	8.6	48329.59	260069.6	5535679.6		
D13_1	5	596	119	344	+spike (group of 5)	1.4	12	10.6	48327.69	259827.3	5535484.19		Regularly spaced targets at the end of the runline

Target	nT	EM 1:1	EM 1:5	Row	MAG	F_Depth	W_Depth	F_Alt	Field nT	UTM_E	UTM_N	SSS Concords	Notes
D13_2	5	562	112	264	+spike (group of 5)	1.6	12	10.4	48328.12	259838.8	5535427.72		Regularly spaced targets at the end of the runline
D13_3	4	450	90	294	+spike (group of 5)	1.6	12	10.4	48326.35	259832.5	5535448.16		Regularly spaced targets at the end of the runline
D13_4	5	596	119	320	+spike (group of 5)	1.4	12	10.6	48327.11	259828.1	5535466.46		Regularly spaced targets at the end of the runline
D13_5	4	504	101	367	+spike (group of 5)	1.2	12	10.8	48327.86	259829.2	5535502.29		Regularly spaced targets at the end of the runline (Dive one to confirm whet they are)

Key to headings

Target	The target number, composed of [search area] + [run-line] + [sequential number]
nT	Measured magnetic field strength in nanoteslas
EM 1:1	The estimated mass for a point source object (derived from the Hall equation)[11]
EM 1:5	Estimated mass for a long thin object (derived from the Hall equation)
Row	The row number in the data file of this target
MAG	The characteristics of the time series graph anomaly
F_Depth	Towfish depth
W_Depth	Water depth
F_Alt	Towfish altitude
Field nT	Measured field strength
UTM_E	Position, UTM easting
UTM_N	Position, UTM northing
SSS_Concords	Concordances with side-scan sonar targets (Mark James selections) – numbers in brackets are distance in metres to MAG position
Notes	Comments

[11] *Developing Magnetometer Techniques to Identify Submerged Archaeological sites. A Theoretical Study*, Camidge et al, 2009, p36